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Public Supplies and Defence

Forethought to Meet Eventualities

AT a time when this, that or the other aspect of civilised life is under examination regarding its ability to stand up to conditions for which it was never designed, the position of electricity supply as an instrument of national self-preservation calls for the same kind of attention.

One set of circumstances especially favourable to security is that industrial towns in this country are closely spaced and that our generating stations are near the loads they normally serve. This has two advantages : one is that such stations are in defended areas and so can hardly be singled out for attack from the air; the other is that transmission lines between stations and industrial centres (vulnerable links in some countries) are usually short and are confined to easily patrolled routes.

Value of the Grid

On the other hand a defect in an overhead transmission line, however caused, can be quickly rectified. A generating station is in a different case. It might be put out of commission for several months by chance damage from a bomb, or consequential damage due to splinters or displaced material hitting a boiler, steam pipe, turbine governors or busbars.

The practice in Great Britain of interlinking stations with a view to economising fuel and pooling reserve plant has the incidental advantage that it enables load to be transferred to other stations from one which may have been put out of action or overloaded by the demands of munitions making.

While the whole of the national pool of plant can be controlled in the interests of efficiency from one point, so that half of the country's output is provided by only fourteen stations, the grid can be divided into quite small self-contained districts to which any of the 171 stations connected to the system can contribute its full quota in emergency.

From the aspect under discussion, it is fortunate that it is not practicable, either technically or commercially, to put the grid underground. Overhead lines present no kind of target to air attack and chance injury would have less far-reaching effects than it would were cables used. Indeed, the greatest risk of interruption to supply by hostile aircraft would come from bombs dropped promiscuously in the streets of towns, and cable repair gangs would probably be the most hard worked of the emergency organisations. Some of the cable makers have worked out plans for mobile repair units to be available at various centres. Such disturbances would, however, be local in their effect.

Nevertheless, some recent happenings have given rise to questions as to whether certain weaknesses disclosed, *e.g.*, the inability to make full use of the grid as stand-by, are likely to give trouble in even more critical circumstances. It is not an adequate reply that such occurrences have been few and that the many more occasions on which the grid has kept the supply going have not, in the nature of things, received the same publicity. Nor is it enough that in the layout of the newer stations, full recognition has been paid to the essential requirements of physical as well as electrical segregation of plant items and of ability to cope with outbreaks of fire.

Steady work is, it is true, being carried out on the older systems, and this should provide reasonably adequate insurance of good service if the need to sell electricity at a reasonable price were the chief consideration, but unfortunately this is not so now.

Speeding-up Normal Measures

The requirements for promoting security for ordinary purposes are, with the exception of certain modifications in building structures, much the same as they would be for national defence. Nevertheless, what may be merely desirable in normal times would become essential in a national emergency.

The £1,500,000 allocated by the Treasury for spare plant is to be used, we believe, only to replace apparatus actually damaged by enemy action. Money should also be spent in speeding up the elimination of weak spots, and the provision of ways and means of doing so is a national matter.

While the present method of public supply may be regarded as flexible and sound enough to justify confidence that it will be able to cope with the calls that may be made on it, it is merely a commonsense precaution to allow for possible eventualities. The industry is in the strong position of having traditionally used the best materials. Moreover, the men engaged in it have had special experience in improvising means to meet unforeseen circumstances. But the less such powers of improvisation are called upon, by virtue of the exercise of forethought, the better.

Compulsory Repairs

SOME of us in the electrical industry are very doubtful whether any Government would have the temerity to risk votes by passing legislation for the compulsory inspection of electrical installations with a view to the remedying of defects. Water suppliers are bolder spirits, as witnesses the draft Water Undertakings Bill, which was recently made available to the public. Clause 69 of this measure provides that:—

"If the undertakers have reason to think that some injury to or defect in a pipe or other water fitting which they are not under an obligation to maintain is causing or is likely to cause waste of water or injury to person or property, they may execute such work as they think necessary or expedient in the circumstances of the case without being requested to do so, and, if any injury to or defect in the pipe or other fitting is discovered, the expenses reasonably incurred by the undertakers . . . shall be recoverable by them summarily as a civil debt from the owner of the premises. . . ."

Possibly the most interesting part of this clause is the reference to "injury to person or property," which is not taken account of by electrical legislation.

Heat-Pump Air Conditioning

REFRIGERATING plant for summer cooling and (by reversed heat-cycle operation) for winter warming has been installed in the new Westinghouse building at Emeryville, California. About 16,000 cu. ft. per min. of cleaned air of the correct temperature and humidity is circulated in a two-storey building, 90 ft. long by 50 ft. wide with 6-in. concrete walls and a roof insulated with 4 in. of redwood bark. Two 7.5-ton compressors driven by 7.5-HP motors with two 3-HP fans, are provided to cope with requirements estimated at 196,000 BThU for cooling and 238,400 BThU for heating based on 35 deg. F. outside and 70 deg. inside. As the heat equivalent of the electrical energy used in raising to a higher temperature level the heat absorbed at a low temperature is small in relation to the BThU usefully employed, the cost of the process is low and, in the present instance, is said to be comparable with that of natural gas or oil-fired systems. Under the conditions named the area of the radiator surfaces should not be unduly great, and it is the cost of these, where cold winters are the rule, that mainly limits the application of the method.

Why the Delay?

IN our issue of April 7th we reviewed three official documents, *viz.*, the annual report of the Central Electricity Board and the annual reviews of statistics by the Electricity Commissioners and by the London and Home Counties Joint Electricity Authority. The first was published three months after the period with which it deals; the second, for which figures under many heads from nearly 600 undertakings had to be collated, covered a period that ended twelve months before; the third was similar on a smaller scale, and in addition included details of all the tariffs offered by the 75 undertakings in its area on January 1st of this year. The interest of such returns is greatly enhanced if they are issued soon after the period to which they relate, and these reports are commendable in this respect. An annual report that may owe even more of its value to prompt publication is that of the Factory Department entitled "Electrical Accidents." This puts forward constructive proposals not only for preventing recurrence of accidents, but also for guarding against risks that might reasonably be anticipated with the increasing severity of the conditions in which electricity is used. Yet the lessons to be learned from dangerous occurrences in 1937 were not available to the public until last November! In this case the proverb "delays are dangerous" can be taken literally, and we hope we shall not have to wait so long for the next edition.

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Cosmic Rays

ENGINEERS are apt, generally, to consider natural phenomena first of all in relation to their possible utility. Professor P. M. S. Blackett's Kelvin Lecture on "Cosmic Rays" appeared to stimulate the imagination of his audience to envisage all manner of possible consequences from the bombardment of the earth from outer space by up to twenty particles per minute at astronomical values of electron volts. Except in one case, however, electrical engineers will have to await the further work of Professor Blackett at Manchester, which has a threefold distinction in relation to the I.E.E. just now, as it is also the scene of the work of the President, Dr. A. P. M. Fleming, and of this year's summer meeting (participation in which is not limited to those who have already sent in their names, though others should not delay their applications). The exceptional case was the one mentioned by Dr. C. C. Paterson in proposing the vote of thanks to the lecturer when he restated the theory advanced in his memorable lecture on discharge lighting to the Illuminating Engineering Society in 1932. This was to the effect that were it not for the collision between ions from outer space and gas atoms in the tube there would be nothing to start the discharge.

Why Not Electricity?

IN the matter of water heating it has long been a selling point for gas that it enables hot water to be obtained instantaneously, while electricity is better applied to storage heating. Some electrical people have regretted that instantaneous electric water heaters have made little headway, but they can console themselves with the thought that perhaps, after all, there is something in storage heaters. Speaking at the recent conference of the British Commercial Gas Association, Mr. R. J. Rogers deprecated the advocacy of instantaneous heaters to the exclusion of the storage type which, he said, had much to commend it for service in thousands of domestic premises. We should not let the gas people have it both ways. Even if gas is best for rapid heating (which we need not admit), it is certainly inferior to electricity for storage heating—if supply authorities will offer the right price. And as we have constantly urged, water heating possibilities warrant a careful examination of the tariff question.

Telling the World

THE poet Pope mentioned a contemporary who did good by stealth and blushed to find it fame, and it seems that British engineers and industrialists have long been following this course. They are constantly carrying out work in their normal course of business which is worth "making a song about," but they prefer to let their achievements speak for themselves. In spite of the old saw, actions do not always speak louder than words, and to remedy this the Federation of British Industries has appointed a sub-committee to consider the best means of advancing news of British industrial enterprise and achievement overseas and of assisting the Government's new campaign on behalf of British industrial propaganda overseas. The move is thoroughly justified and should lead to the British trumpet being heard more distinctly in the rather noisy modern "concert of nations."

POWER FOR INDUSTRY

The System of the South Wales Electric Power Co.

BY the courtesy of Mr. L. Howles, general manager of the South Wales Electric Power Company, we recently spent a few days in the company's area studying the methods of supply to mainly very large industrial consumers. About 90 per cent. of the output of the undertaking is used for industrial purposes and output and maximum demand, apart from over 30,000,000 kWh exported to the grid, last year were 252,656,913 kWh and 63,260 kW respectively. The load factor was 45.6 per cent.

From the broader point of view the most interesting feature of the story we have to tell is that in this depressed area, while the output of the major industry —coal mining—has declined the electricity output has increased, not mainly by way of the domestic supply, although this side of the undertaking's work is active and has made great progress, but almost entirely by the increasing use made of the public supply by the large industrial concerns in the area and in particular the replacement of pit-head generating plant by connections to the Power Company's system.

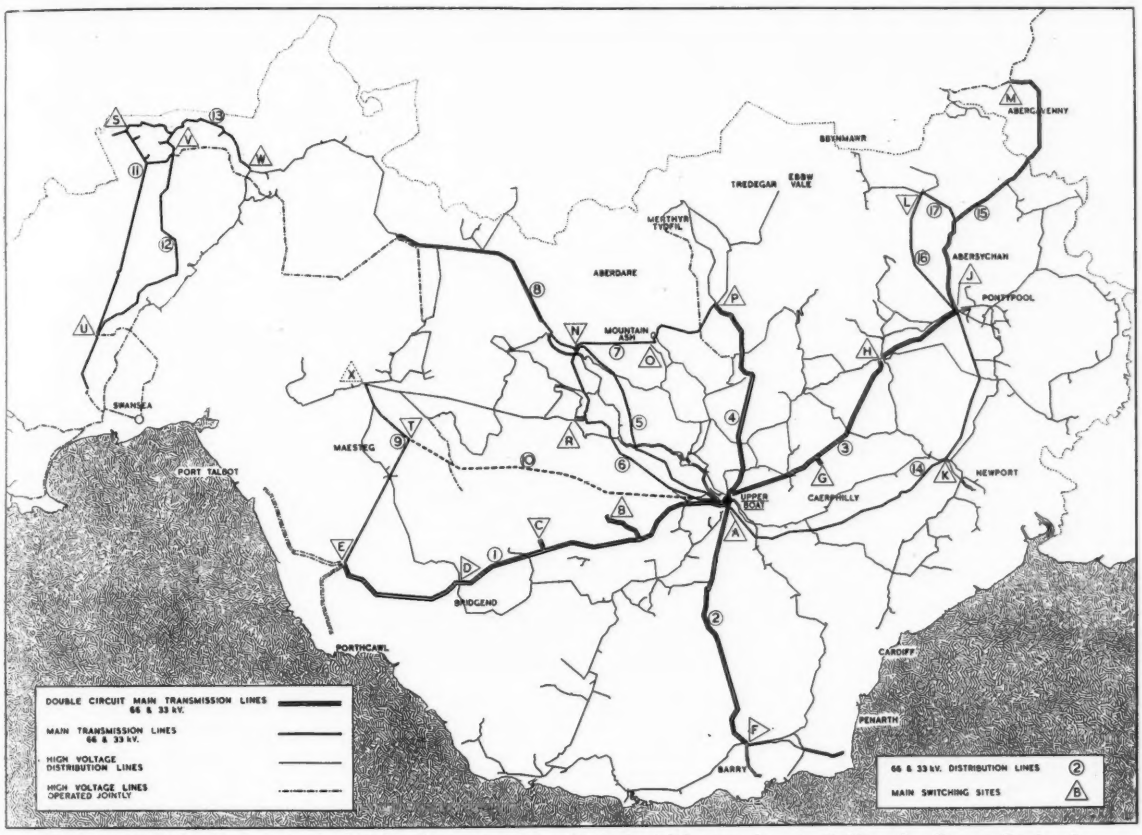
The area covers 1,100 sq. miles, consisting of the whole of Glamorganshire, the major part of Monmouthshire and sections of Brecknockshire and Carmarthenshire. Generally the scheme may be referred to as one of bulk-supply catering, for in addition to twenty-one bulk supplies afforded to such towns and districts as Abertillery, Cardiff, Mountain Ash, Rhondda, Penarth and Tredegar, there are the very many industrial concerns taking high-voltage supplies.

Very broadly and with a measure of topographical licence we visualise the greater part of the area as a circle with its centre at Upper Boat, near Pontypridd, where the supply is generated and from which main distribution radiates direct from a new centre. From this point of view there exists no "primary" transmission in the sense of bulk transmission to a central distribution centre—an ideal setting, on the map at any rate.

The circumference of our circle links up Cardiff and Port Talbot in the south, Glyn Neath and Merthyr in the north and Pontypool and Newport in the east. There is an annexe to the circle which tails off in the west from Glyn Neath and Port Talbot to and including the Gower Peninsula, but we will leave this tail for attention later and now confine our attention to the circle.

To again take geographical liberties, the more famous South Wales valleys in general all radiate northwards from the centre of the circle, forming a kind of wheel-spoke main transmission system to the north from the Upper Boat hub, generally sheltered in the valleys and linking up collieries and iron and steel works en route. Spokes to the larger towns and industrial works throughout the mainly rural country south of Upper Boat complete the wheel.

Actually the valleys to the north are in two groups, those radiating from Newbridge and Pontypool which contain many collieries and steel, tin-plate and engineering works, and those radiating from Upper Boat



The South Wales Power Co.'s distribution scheme in the industrial area, i.e., excluding the Gower Peninsula

MAIN TRANSMISSION LINES:

(1) Upper Boat/Pyle 66/33 kV Double-Circuit; (2) Upper Boat/Barry 33 kV Double-Circuit; (3) Upper Boat/Old Furnace 33 kV Double-Circuit; (4) Upper Boat/Nantwen 33 kV Double-Circuit; (5) Upper Boat/Middle Fan 33 kV via Llwyncelyn, Single-Circuit; (6) Upper Boat/Middle Fan 33 kV via Glamorgan Colliery, Single-Circuit; (7) Middle Fan/Mountain Ash 33 kV Single-Circuit; (8) Middle Fan/Maerdy/New British Rhondda 33 kV; (9) Pyle/St. John's Colliery/Duffryn Rhondda 33 kV; (10) Upper Boat/St. John's Colliery 66 kV Under Construction; (11) Manselton/Gwaun-cae-gurwen/Brynamman 33 kV; (12) Pantlasau/Gwaun-cae-gurwen 33 kV; (13) Gwaun-cae-gurwen/Lower Cwmtwrch 33 kV; (14) Upper Boat/Pontymister/Old Furnace 66 kV; (15) Old Furnace/Abergavenny 66 kV and 11 kV Double-Circuit; (16) Old Furnace/Blaenavon 66 kV; (17) 66-kV Line to Blaenavon Steel Works. (Tapping off Abergavenny Line).

66-KV AND 33-KV SWITCHING SITES:

(A) Upper Boat; (B) Coedely; (C) Werntarw; (D) Litchard; (E) Pyle; (F) Brynhill (Barry); (G) Bedwas; (H) Newbridge; (J) Old Furnace; (K) Pontymister; (L) Blaenavon; (M) Abergavenny; (N) Middle Fan; (O) Mountain Ash; (P) Nantwen; (R) Glamorgan Colliery; (S) Aberpergwm; (T) St. John's Colliery; (U) Pantlasau; (V) Gwaun-cae-gurwen; (W) Lower Cwmtwrch; (X) Duffryn Rhondda (under construction).

where there are many collieries producing bituminous and steam coal and benzol and oil-production plants. In the southern rural area there are large cement, chemical, engineering, railway and ship-repairing works.

Upper Boat generating station and Treforest Trading Estate

Generation at Upper Boat is at 33 kV and at present all major distribution from the new centre is at the same voltage. There are two separate 33-kV switch houses, as a fire-precaution measure, and the switchgear consists of type "OLG.IB" duplicate bus-bar oil- and compound-filled equipment produced by the English Electric Co., Ltd., and having a rupturing capacity of 750 MVA. There are ten feeder, four station-transformer, three generator, one bus-section and two C.E.B. switches, and provision is made for two extra generator switches for the two sets now being installed in the station. Two of the station-transformer switches control two 7,500-kVA, 33/11-kV transformers for 11-kV distribution, and the other two control two transformers supplying energy for the station auxiliaries.

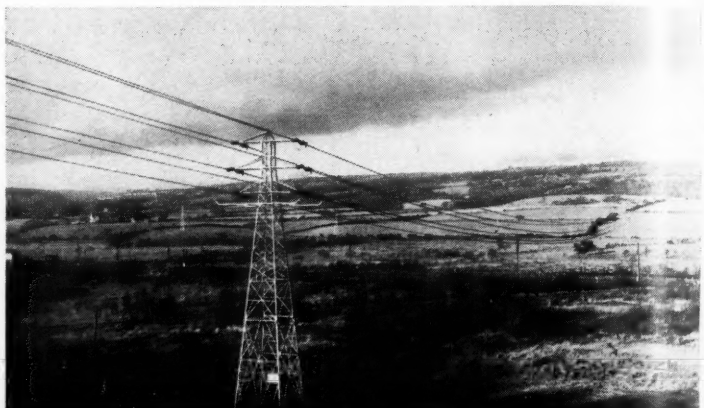
There are at present six main transmission lines in operation direct from Upper Boat, to Pyle in the south-west, Barry (S.E.), Old Furnace (E.), Nantwen (N.) and two to Middle Fan (N.W.). These are constructed for 33-kV operation except those to Pyle which will operate in the future at 66 kV and the one to Nantwen which is designed for stepping up to 66 kV. This is a steel lattice tower, double-circuit line with suspension insulators and 0.1 sq. in. equivalent steel-cored aluminium conductors.

The Barry, Old Furnace and Nantwen lines are also double circuit. The steel-tower Barry line was erected in 1925 with 0.1 sq. in. copper conductors and 55-kV pin insulators, but it has recently been reinsulated with 55-kV Lapp post insulators. The Old Furnace steel-tower 0.1 sq. in. copper conductor line has been largely rebuilt and converted into a suspension insulator line, except for sections which have been reinsulated with Lapp units, and the original 33-kV belted underground cable sections have been replaced by overhead lines.

The Nantwen line is of lattice tower construction with suspension insulators and 0.1 s.c.a. conductors. The two lines to Middle Fan are single circuit and both designed for 66-kV working. One radiates via Llwyncelyn and has 0.1 sq. in. s.c.a. conductors on lattice towers and the other which goes via Glamorgan Colliery is constructed with wood H poles, horizontal stringing suspension insulators and 0.15 sq. in. copper conductors.

The Pyle feeder serves four main switching stations. The one at Coedely provides a 33-kV supply to the Welsh Navigation Collieries and is one of the points on the system where private generation and public supply are in parallel. One of the Upper Boat to Pyle circuits is looped into this outdoor sub-station which has span-bus-bars, sectioned by rotary isolators. The supply is metered at 33-kV and the 3,000-kVA English Electric transformer is controlled by a solenoid operated E.E. "OKD.IB" circuit breaker. The brick control room on site is equipped with a battery and control panel. Another loop on the same line is taken to Wern Tarw where an outdoor sub-station, with Switchgear and Equipment rotary isolators on span bus-bars, two 1,500-kVA and two 625-kVA Metrovick transformers controlled by solenoid circuit-breakers afford a supply to the South Wales Coalite Co., Ltd. The control room is brick built.

A third loop-in at the Litchard sub-station gives a 33-kV supply to the new Royal Ordnance Factory and an 11-kV supply to the Bridgend U.D.C. The overhead equipment is of similar construction to that of the previously mentioned stations, and there are two 1,500-kVA 33/11-kV Brush transformers. At the Pyle terminus a 33-kV outdoor sub-station and a 33-kV brick sub-station are coupled by underground cable and afford supplies to the Guest Keen Baldwins steelworks at Margam, the Porthcawl Electricity Co., Ltd., and St. John's Colliery at Maesteg.



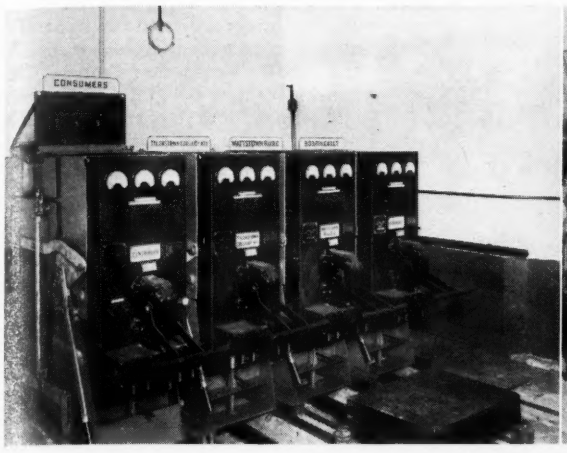
Bog and railway crossing at Nelson on the Upper Boat-Nantwen line

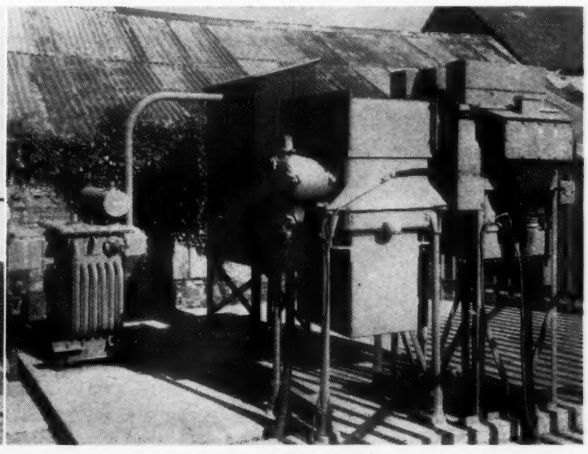
Old Furnace sub-station showing (right) 66-kV lines to Abergavenny and (left) 66-kV wood-pole line to Upper Boat and 11-kV line to Panteg steel works

A scheme for the near future is to step up one of the feeder circuits for 66-kV working and to run another feeder direct from Upper Boat. Provision has already been made for 66-kV outdoor bus-bars, switchgear and transformers. It is also proposed to link up the Pyle station with the outdoor sub-station at Aberpergwm 20 miles north. There are four 33-kV E.E. solenoid-operated oil circuit breakers in the Pyle outdoor sub-

station and a five-panel E.E. metalclad board in the indoor station.

At the end of the Barry feeder a switching station is being built with H poles, 0·2 sq. in. copper conductors and suspension insulators. This line will constitute a main transmission line to Old Furnace and will enable





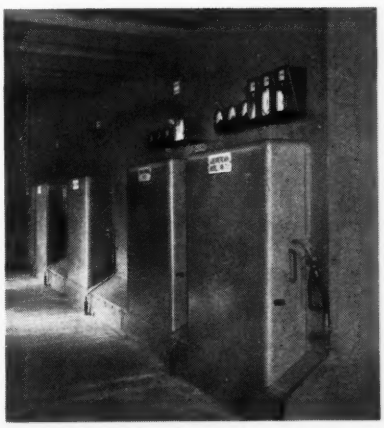
11-kV switchgear at Tylorstown sub-station. (Right) Ring-main unit at St. Athan sub-station, showing small transformer and box for local distribution

at Brynhill affords 11-kV supplies to the G.W.R. at Barry Docks, the Penarth cement works, Penarth Town, Barry U.D.C., the Cardiff R.D.C., and the Vale of Glamorgan. In the sub-station building there are two 4,000-kVA Metrovick 33/11-kV transformers and a nine-panel SWS cubicle switchboard for local distribution.

The Old Furnace feeder is first looped in at Bedwas for a 33-kV supply to the Bedwas Navigation Collieries, and here again the consumers' generating plant runs in parallel with the public supply. The whole layout is similar to the other stations, and there are two 2,000-kVA, 33/3.3-kV E.E. transformers. At Newbridge, on the same line, there is another loop-in step-down sub-station for 11-kV local distribution, and the equipment includes a 6,000-kVA, 33/11-kV E.E. transformer controlled by a Reyrolle switch-fuse and a seven-panel 11-kV SWS cubicle-type switchboard for the network.

33-kV switchgear at Upper Boat power station

At the terminal station, Old Furnace, the voltage is stepped up to 66-kV for supply interchange with the Shropshire, Worcestershire and Staffordshire Electric Power Co. at Abergavenny and supply to the Blaenavon steel works. There is also a stepped-down supply (11kV) for several large collieries and steelworks in the district and for local distribution. The indoor sub-station contains a seven-panel 33-kV E.E. switchboard and tap-change pedestals for the two 8,000-kVA 33/11-kV and one 10,000-kVA 33/66-kV transformers. The step-up transformer is controlled on the secondary side by a 66-kV E.E. solenoid-operated oil-circuit breaker.



33-kV air-blast switchboard at Glamorgan colliery

There is now under construction a 66-kV line from Upper Boat to Old Furnace, via Pontymister, and it is larger supplies to be afforded to the Shropshire Company directly at 66 kV.

There is also in existence from Upper Boat to Old Furnace, via Pontymister, a 66-kV distribution line, and this is looped into a sub-station at Pontymister for 11-kV supplies to the Pontymister and Rogerstone steel works, Henry White's Foundry, the Risca U.D.C., and a local 11-kV network. This sub-station is equipped with two 4,000-kVA Metrovick transformers.

The 66-kV supply to the Shropshire Co. at Abergavenny is conveyed by one leg of a 66-kV and 11-kV double-circuit line from Old Furnace. This leg constitutes an interconnector between the two power companies' systems, and the 11-kV circuit caters for general distribution in the West Usk and Abergavenny Order areas. The line is erected on lattice steel towers with suspension insulators and 0·1 sq. in. s.c.a conductors. The interconnection with the Stourport power station at 66 kV is made through a single-circuit line running from Stourport via Hereford.

There is also now under construction another line from Old Furnace to Blaenavon for a supply to the Blaenavon steel works and to the local 11-kV network. The steel works are at present fed by a spur off the 66-kV Old Furnace to Abergavenny line and is of H-pole construction with suspension insulators. This spur will form a standby to the new 66-kV line to Blaenavon. The sub-station here is equipped with two 6,000-kVA, 66/11-kV transformers controlled by Asea 66-kV minimum-oil circuit-breakers. The control room equipment includes transformer tap-changing gear.

The terminal station on the Nantwen main

transmission line affords an 11-kV supply to the G.K.B. Collieries and works on the Dowlais 11-kV ring main. It is a brick-built sub-station with a five-panel E.E. switchboard, two 4,000-kVA 33/11-kV Metrovick transformers, control panels for the switchgear and tap changing and a rectifier for switch operation.

Cradle crossing over P.O. wires and Cardiff-Pontypridd road on Upper Boat-Nantwen line

At the end of the Middle Fan main transmission line a 33-kV brick sub-station provides a supply to the Ferndale group of collieries and the general network. A second supply into this sub-station is given by a tee-off from the Upper Boat to Ferndale feeder. The equipment includes a seven-panel 33-kV switchboard, two 6,000-kVA 33/11-kV transformers, and a nine-panel 11-kV board.

From Middle Fan sub-station there is a continuation of the Upper Boat to Middle Fan transmission line to Aberpergwm, connecting with the extensive transmission system of the Amalgamated Anthracite Collieries, and an 11-kV supply feeding to the company's networks. This line runs via Maerdy and New British Rhondda. The Middle Fan to Maerdy section is of H-pole construction with 0·1 sq. in. copper and suspension insulators, and from Maerdy to New British Rhondda an existing 11-kV double-circuit steel tower with 0·1 sq. in. copper conductors has been converted for 33-kV working on one circuit. The New British Rhondda to Aberpergwm line consists of two separate single-circuit lines with 0·1 sq. in. copper conductors and suspension insulators—one line for 33 kV and one for 11 kV.

The equipment at Aberpergwm sub-station includes the usual span bus-bars and rotary isolators, two 3,500-kVA Metrovick 33/11-kV transformers, and a 4,000-kVA transformer. The colliery generating plant runs in parallel with the public system.

On the Upper Boat-Middle Fan main transmission line there is a loop-in to the brick sub-station at Glamorgan colliery, operated by the Powell Duffryn Company, to which a 5,000-kVA 33-kV supply is afforded. In this sub-station there is a five-panel 33-kV Brown-Boveri air-blast truck switchboard and 33-kV metering.

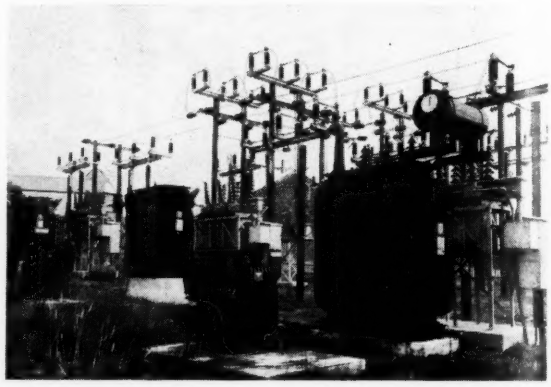
The Middle Fan and Nantwen sub-stations are interconnected by a 66-kV line at present operating at 33 kV. It is of H-pole construction with horizontal stringing suspension insulators and 0·15 sq. in. copper conductors. This line is looped into a sub-station at Mountain Ash, from which are supplied Nixon's Navigation Colliery, Mountain Ash U.D.C., and a local 11-kV network. This is an indoor sub-station with a five-panel 33-kV switchboard, two 4,000-kVA, 33/11-kV transformers, a nine-panel 11-kV switchboard and a rectifier for switch-closing purposes.

Another line at the moment under construction is Upper Boat to St. John's Colliery. It is designed for 66 kV, but will be operated at first at 33 kV. Of H-pole construction with 0·2 sq. in. copper conductors and suspension insulators, it is expected to be in service by next autumn. Another line to this sub-station has recently been built from Pyle and will be extended to Duffryn Rhondda. This is of similar construction except that the conductors are of 0·15-sq. in. copper. The St. John's Colliery sub-station is an outdoor one with one 3-000-kVA transformer at the moment and 33-kV metering, and there is a brick control room. Public supply will also run in parallel at this point with the plant owned by the Nartho Navigation Colliery Co.

Another new 33-kV feeder is being laid direct from Upper Boat to the new I.C.I. factory at Merthyr. This line will consist of 0·2-sq. in. copper conductors on H-poles with suspension insulators and will cater for a works load of 12,000 kVA. A second line to the same works is being erected from the Nantwen sub-station. Of H-pole construction with 0·1 sq. in. copper conductors and suspension insulators, this line will act as a standby for up to 5,000 kVA. The Nantwen-Merthyr line will be completed in April, and the Upper Boat to Merthyr line in September.

The whole of the 11-kV network erected during the past five years in the colliery areas where reliability is of prime importance has been constructed for 33-kV working. These lines are of H-pole construction, with horizontally disposed conductors at 7 ft. phase spacings, suspension insulators and 0·15-sq. in. copper conductors.

The 11-kV lines for general distribution in areas which are not so highly industrialised are of single-pole construction and insulated with Taylor Tunnicliff "PN 16" insulators. The majority of these lines have 0·15 sq. in. copper conductors. In entirely rural areas the majority of new development lines are of 11-kV swan-neck construction with 0·025-sq. in. copper or cadmium-copper conductors. In certain cases the undertaking has erected combined 3·3-kV and low-voltage distribution lines, the two sets of conductors being erected on the same poles in vertical formation.



33,000-V/3,300-V sub-station at South Wales Coalite Co., Ltd.

We propose in a further article to give some impressions gained during our tour, particularly from the consumer's aspect.

(To be continued.)

The British Association

SIR Albert Seward, D.Sc., F.R.S., is president for the Dundee meeting of the British Association for the Advancement of Science (August 30th-September 6th). The president of the Engineering Section is Mr. H. E. Wimperis, C.B., C.B.E.; Mr. R. S. Whipple will preside over the Mathematical and Physical Sciences Section and Dr. A. P. M. Fleming over the Educational Science Section. Their respective addresses will cover "The Future of Flight," "Instruments in Science and Industry" and "Education for Industry."

The preliminary programme of the meeting which has just been issued gives particulars of membership, a list of hotels and boarding houses in Dundee and district and brief details of the sectional meetings. We notice that the Engineering Section is to discuss air conditioning. A number of visits to works and other places of interest are being arranged.

Full particulars are available from the Secretary of the British Association, Burlington House, Piccadilly, W.1.

NEW SWITCHGEAR FACTORY

Planned Production

JUST seven years ago we described a factory at Banbury, in Oxfordshire, then newly established for the manufacture of air-break switchgear and overhead line accessory equipment. So vigorous did the growth of that young business become that the necessity for the building of an entirely new factory on a fresh site soon became obvious. With future probabilities in mind, a freehold site of twelve acres was accordingly acquired and the first portion of the new factory has now been built, with administrative accommodation, covering a floor area of approximately 30,000 sq. ft. It is completely equipped and in full production.

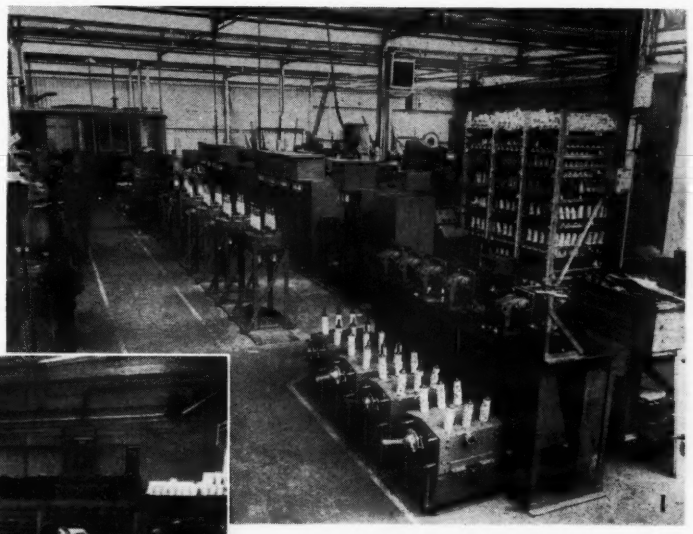
Indeed, when we visited the new premises earlier this year the assembly shops were already occupied to full capacity, foreshadowing further expansion in the near future. But the site is ample, and though Switchgear & Equipment, Ltd., is not an old concern its directors have for twenty years specialised in the design and manufacture of switchgear. They have made use of their long experience in laying out the new works so as to ensure an orderly flow of production, and have planned the single storey executive offices at the front and the workshops behind so as to facilitate the easy and rapid extension of either without dislocating the other.

The range of specialities manufactured has from the beginning included air-break disconnecting switchgear for low voltages and higher ranges from 11 kV up to 110 kV, as well as liquid-filled fuses of high rupturing capacity for high voltages. More recently there have been added oil-immersed circuit-breakers, kiosk sub-stations and cubicle type gear. A number of these, together with compound filled vertical draw-out switchgear embodying circuit-breakers of tested rupturing capacities up to 150 MVA (in course of assembly), were in evidence at the time of our visit. Indoor cubicle switchgear is also made, together with low-voltage fuse units and feeder pillars, and a variety of accessory fittings for overhead distribution and transmission lines.

The completeness of the factory plant will be appreciated when it is realised that the company manufactures practically everything it sells from the raw materials. It even fabricates circuit-breaker tanks, which are of the round pattern, and large kiosk housings from raw steel plates. This policy, which the directors claim gives them much greater control over the finished product, accounts for the array of modern light and heavy machine tools occupying two bays, all of which are individually driven by their own motors, mostly bolted to the floor or on short angle-steel pedestals, with push-button controllers.

Incidentally, this drive feature is responsible for the complete absence of overhead shafting and belting, avoiding obstruction of the light from the enamelled reflectors containing mercury vapour lamps suspended from the roof in two parallel rows per bay. Shop air heating is on the system that combines hot-water coils with motor-driven fans suspended from the roof, controlled by thermostats and magnetic valves in the overhead piping. Office radiators are supplemented by built-in electric fires and electric tubular heaters in the corridors.

Steam for cement setting and hot water, with a calorifier and motor-driven circulating pumps, are provided by two auto-gravity feed coke boilers operating at 100 lb. per sq. in.



Immediately behind the office block are the two machine tool bays, and behind them the fitting and assembly operations progress along the five bays forming the central portion of the factory. The test section at the far end is equipped with transformers, calibration and other instruments sufficiently adequate to cover the whole of the range of the company's manufactures.

In one extreme corner next to the testing enclosure is the works 11-kV step-down transformer sub-station and main factory distribution board made up of iron-clad switch-fuse boxes of 60-A and 100-A sizes at 500-V.

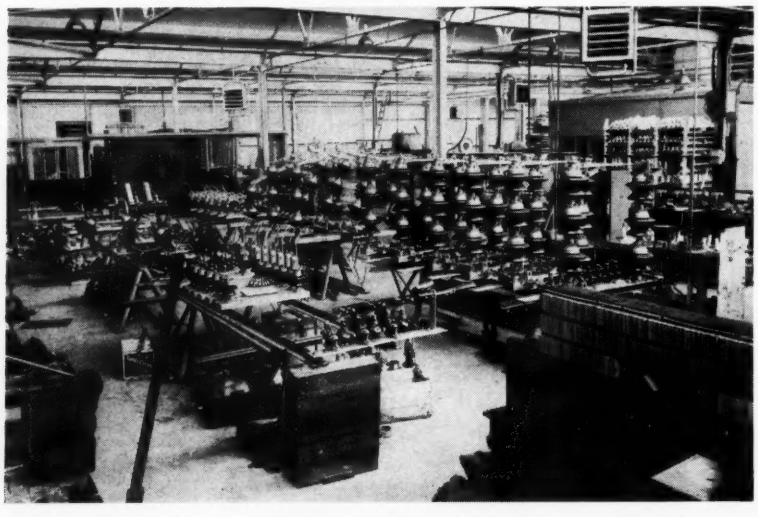
The raw material stores is ranged along the

[Elec. Rev. photos.

1.—A section of the oil-switch assembly department. 2.—Insulator assembly section. 3.—High-voltage liquid fuse department

whole of one side of the factory, feeding materials appropriately and directly into the various bays exactly where they are required, and with the minimum of handling. For instance, the light materials requiring such operations as drilling, turning, milling, &c., are adjacent to the bays which contain the machines for performing these operations, whereas steel sheets and sections requiring fabricating are in the stores near the respective bays containing the folding, shearing and cropping plant, gas-flame cutting and electric welding equipment, and the paint spraying outfits.

Similarly, porcelain insulators are stored near the insulator cementing department and the temperature and humidity



High-voltage air-break switchgear assembly section [*Elec. Rev. photo.*

controlled steam-setting ovens, so that as the metal fittings are attached and the steam-setting process is completed the finished insulators pass directly to the assembly benches where they are built up as required.

A pneumatic system is installed throughout the factory, operated from a central compressed-air plant, so that the portable power-driven screwdrivers, drills, riveting, tapping and grinding tools, &c., can be applied to the product wherever it happens to be, without interfering with its orderly progress through the factory.

The factory is also equipped with a modern electro-plating plant enabling various metal finishes such as nickel plating, tinning, &c., to be controlled. Care is taken to ensure a sufficient deposit of the finishing metal, which is of the utmost importance as so much of the equipment produced by the company is installed out of doors and subjected to adverse weather conditions in various parts of the world.

The planning and progress system is designed to ensure efficient production control and minimise cost by eliminating waste time between operations and concentrating the operators' energies on the work for which they are paid, *viz.*, machining, assembling, &c. The route for each article is planned before it is issued to the shops, and all movements of materials and drawing are effected by the stores department.

As the operator finishes one job his next is waiting by his machine and the time card is already in the clock rack. He does not have to go to the foreman for a job, to the office for cards or drawings, or to the stores for material, and the progress department knows at any time where any article is situated. By planning ahead, work is distributed most economically over machines and such decisions as the need for overtime to cope with a rush of orders can be made in time to avoid interference with delivery promises. By pre-allocating material so that the stock records show the future requirements of the shops the danger of hold-ups due to lack of material is reduced to the minimum.

Complementary to this aim of production efficiency is the policy of the company to avoid rushing the actual operation times. Day-rates and a fixed merit bonus are paid to avoid the danger of hasty workmanship, which is so often a feature of piece-rates and other incentive payments, excessive costs being prevented by continuous comparison with predetermined standards. A further safeguard to the customer is the presence of an engineer directly responsible to the management for the quality of the finished gear.

All machine operations are fully jigged to ensure the degree of accuracy and uniformity essential to interchangeability. Similarly, steel templates control all operations in the welding and fabricating departments. A very rigid system of inspection prevails and every piece of apparatus is subjected to a routine high-voltage test before being passed to the packing department.

The policy of the directors has always been to produce a range of switchgear of clean design embodying wherever possible definite improvements over existing types and incorporating good-quality materials and high-class workmanship. This aim has no doubt been greatly facilitated by the provision of this up-to-date factory, and the modern system of lighting, heating and ventilation must add greatly to the comfort and amenities of the staff and workpeople, who certainly appear to be carrying out their various tasks under conditions very different from those to be found in the older industrial centres.

News from Australia

By Our Correspondent

THE Electric Light and Power Supply Corporation, Ltd., of Balmain, Sydney, has awarded a contract for the supply of electrical equipment to the value of about £250,000 to the English Electric Co., despite the fact that a lower quotation was submitted by a German firm. A principal of the Corporation said that they considered every aspect of the matter before deciding. Cost, reliability of delivery and general policy were all gone into thoroughly, and finally they decided to buy the British goods. They expect that the plant will be delivered by about the end of 1940 or the beginning of 1941.

* * *

The possibility of a complete failure of the Burrinjuck hydro-electric supply to Canberra and neighbouring towns is being met by the installation in Canberra of two extra steam-turbine generating stations, and it has been definitely stated that power would not in any circumstances be "rationed." Up to the present the local station has been able to meet the shortage of supplies from Burrinjuck.

* * *

The Sydney County Council, which generates the bulk of Sydney's electricity, has decided to have a "show down" with Australian manufacturers. According to the report of the general manager (Mr. Forbes Mackay), two Australian firms tendered £45,964 for 26,000 electricity meters, while a Canadian tender was for £36,364. Referring to collusion between manufacturers in submitting identical tenders, Mr. Mackay told the Council that he had repeatedly threatened to buy overseas unless the local product was offered at a reasonable price, but that he had not been successful in obtaining concessions because the manufacturers assumed that he was bluffing. They knew from past experience that the Council would not buy overseas. In the present case the Canadian tender, with exchange added, was cheaper than the local price, but if the usual 10 per cent. margin was added as local preference, then the Canadian price would be £1,344 dearer. He recommended that the Council should order overseas, and he also thought that the Council should be relieved of exercising the 10 per cent. preference in favour of Australian goods. After considerable discussion the Council decided to place the order for meters overseas unless arrangements were made by the Australian manufacturers for a reduction in price.

* * *

The managing director of the Australian Electric Co., Ltd. (Mr. R. N. Denford), recently announced that the manufacture of electrical equipment for two English organisations would shortly be commenced in Perth.

* * *

Sydney is still trying to solve many problems concerned with its electricity supply, but the most important of all is that of decentralisation. Bunnerong power station has been described as an ideal target for ships at sea or raiding aircraft, but experts, while admitting its vulnerability, do not subscribe to the view that it is an "ideal target." However, it has been recommended that the £2,000,000 extension plan be diverted to some other site so that risks involved if the present power house were attacked, would not be extended. The three main electricity undertakings will be linked by a scheme which will cost nearly £250,000. The stations concerned are the railway power station, the County Council station at Bunnerong, and the Balmain Company's plant.

PROGRESS IN NEW ZEALAND

Developments and Prospects in a Well-electrified Country

By F. N. Stace, B.E.(Elect.-Mech.), B.E.(Mech.)

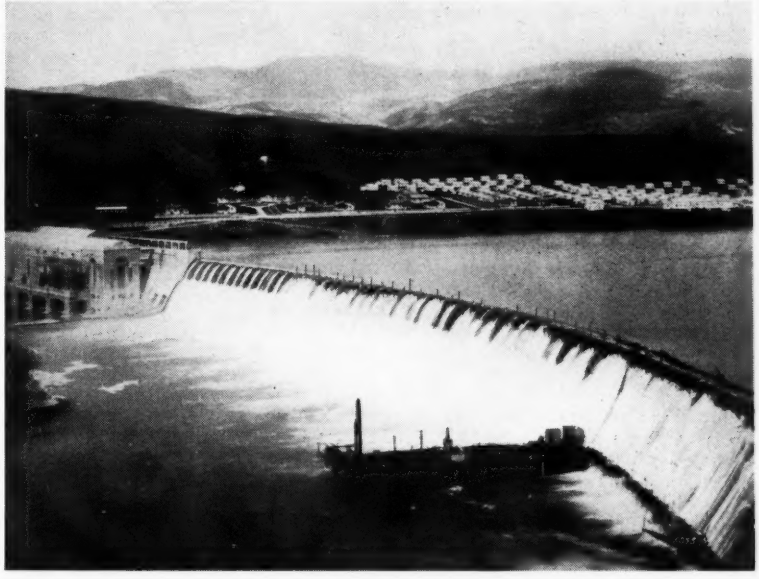
THOUGH it is a comparatively small country, the Dominion of New Zealand is world-famed for its development and use of electricity.

When contracts were placed some years ago for generating machinery for the Arapuni hydro-electric station, it is said that engineers were amazed at the size of the equipment required for so small a country. The two 21,000-kW alternators recently installed in the same station were at that time, at least, the largest ever built in England. At the moment, plans are on foot for the construction of a new transmission line, part of the North Island network, to operate at a pressure of 250,000 V. These three instances give an adequate impression of the magnitude of New Zealand's electricity scheme.

Large as this scheme is already, with a capital outlay of £35,500,000, it will have to be greatly extended in the very near future, as the amazing growth in recent years in the demand for power, coupled with the Government's present campaign for the fostering of New Zealand's industries, is already taxing the present power resources.

Geographically New Zealand is completely isolated. Australia, her nearest neighbour, is about 1,200 miles away, while ten times that distance separates New Zealand from London. The complete lack of mineral oils, a shortage of hard coals, but plenty of available water, made obvious the choice of the last named as a generating medium for bulk supply of electricity.

Electricity supply in New Zealand was pioneered by local enterprise. Wellington and Auckland, and, to a lesser extent, Christchurch, began with steam generating plants. Dunedin early developed hydro-electric supply at Waipori and Reefton had hydro-electric supply as early as 1887. Stratford in 1898 and Hawera in 1902 both had early generating plants.



A view of the Waitaki hydro-electric development, South Island

Reproduced by courtesy of the N.Z. High Commissioner

State Electrical Organisation

In 1904, a report was prepared by the then engineer-in-chief, Mr. P. S. Hay, reviewing hydro-electric resources of the Dominion, and with the appointment in 1911 of the late Mr. Evan Parry as chief electrical engineer to the Dominion and the late Mr. Lawrence Birks as his assistant, the Government electrical organisation came into being and a national electricity supply was established. Lake Coleridge, which began operation in 1915, was the first large-scale Government hydro-electric development.

The design of New Zealand's hydro-electric scheme was based on a probable maximum demand per head of population of 0.15 kW, and it is a great tribute to Mr. Parry's foresight that this figure has now been reached and, in fact, slightly exceeded.

The possibilities of general rural distribution and supply for manifold purposes in homes and on farms were quite evidently foreseen by Mr. Parry. Relatively cheaper methods of distribution were adopted and the supply was given under conditions which enabled domestic, farming and industrial consumers to realise the many advantages of public supply and which paved the way for Dominion-wide development.

Power Boards

The Electric Power Boards Act was passed in 1918. This instituted a new type of local authority, but formed and greatly extended the general principle of local administration and retail supply. The Act was inspired by the ideal of making supply available to every farm and dweller in the back-blocks as well as those residing in city areas. This ideal has now virtually been achieved, as the 1938 Public Works Statement (on the position as at March 31st) reveals that the total population included in the various electricity supply areas, is 1,485,239 or 93.3 per cent. of the total population.

The growth in the number of consumers from 1920 is shown in Table 1, while a comparison of the installed capacity, the amounts generated and sold, and the demand per consumer and per head of population are shown in Table 2.

TABLE 1.—GROWTH IN CONSUMERS SINCE 1920

Year	No. of consumers	Percentage of population
1920	58,449	4.7
1926	192,392	13.6
1936	353,973	22.6
1938	388,580	24.4

The total connected load at the end of March was 1,676,689 kW, an increase of 13.5 per cent. for the year.

Farm and Domestic Loads

With no large industrial demand for power in New Zealand, the supply authorities had to concentrate on the farm and domestic loads. Their ingenuity in securing and tremendously developing large blocks of load is demonstrated in Table 3.

The remarkable growth of load in recent years has brought about the possibility of a shortage of bulk power in the near future. Using the figures for 1920 as a basis, Table 4 sets out the position.

Early in 1938, two additional 21,000-kW units were installed at Arapuni and boring is now progressing in connection with two new penstock tunnels at the same station. The lower development of the Waikaremoana scheme is now in progress which will increase the station output by 40,000 kW in addition to the further 20,000-kW generator supplied in 1938 for the existing power station. Surveys for a new power scheme on the Waikato River near Cambridge are now in progress.

In the South Island, orders were placed last year for two additional units each of 15,000-kW capacity for Waitaki. A new power station to be known as Highbank is to be built on the Rakaia River, and will probably have one unit of

TABLE 2.—INSTALLED CAPACITY AND ENERGY GENERATED AND SOLD

Year	Installed capacity, kW	Generated kWh	Sold kWh	kWh per consumer	kWh per capita
		(millions)	(millions)		
1920	45,000	99	—	—	—
1926	127,000	346	219	1,130	200
1936	320,000	989	775	2,180	526
1938	279,910 (main)				
	99,338 (standby)				
	379,248 (total)	1,250	978	2,518	659

about 22,500 kW. Investigations are being made as to control works at Lake Tekapo which regulates the flow of the Waitaki River. At the moment this flow varies with the melting of snow on the mountain ranges but by raising the level of Lake Tekapo and constructing control gears it will be possible to make the river-flow independent of this factor which will permit of further development at the Waitaki hydro-electric station.

With the projected immediate expansion of New Zealand manufacturing industries, together with the large demand for power incurred by the New Zealand Centennial Exhibition at Wellington this year, there are firm grounds for believing that thermal power plants to carry peak loads will be required, to avert a power shortage in 1940 or 1941. The provision of such plants will not, of course, preclude the necessity for new major hydro-electric schemes.

TABLE 3.—APPLIANCES IN USE

Year	Electric ranges	Water heaters	Milking machines
1926 ...	4,671	6,654	4,856
1936 ...	44,837	58,864	18,458
1938 ...	64,408	77,353	22,711

Electrical Manufacture

Following the application of import control restrictions at the end of 1938, the Government announced its intention of encouraging New Zealand manufacturers. Up to this, electrical manufacturers in this country contented themselves with the manufacture of electrical domestic appliances and accessories only. Plugs, switches, insulators, water heaters, heating elements, ranges, radios, and small domestic appliances comprised the main items.

Just how wide and far the new expansion is intended to go, it is difficult to predict with any certainty. Obviously, however, the manufacture of heavy and specialised electrical equipment will not be attempted.

Methods of Doing Business

New Zealand's traditional policy has always been that of giving preference to British goods. Most large English electrical firms have branches or agents in this country and one agent will usually handle several overseas firms' goods.

In addition to these, there are throughout New Zealand some 1,200 independent electrical contractors and wiremen. These act as salesmen of the small domestic appliances and sell direct to consumers, while many of the 94 supply authorities in N.Z. also have showrooms and retail departments.

Up to the end of 1938 the Customs authorities levied tariffs of, in general, between 20 and 25 per cent. in favour of British goods as against those of any other countries. On December 5th, 1938, the New Zealand Government introduced the system of licensing of imports and exports. The introduction of this measure may be ascribed to two reasons:—

First, the Government was faced with the urgent necessity for conserving its sterling funds in London and building up overseas credits. The early maturing of a large loan necessitated immediate steps being taken to ensure sufficient overseas funds being available not only to meet this loan but also to maintain New Zealand's credit in respect of future commitments.

Secondly, the regulations were adopted as an integral part of the Government's policy for fostering New Zealand's secondary industries, thus achieving a greater measure of self-sufficiency.

Import licences are now required for all classes of goods, including electrical materials, entering New Zealand. Licences are issued for six-monthly periods and any evasion by means of a barter system is precluded by export licences so that goods exported to any country are assured of having their sale credited to the Government which then reimburses the local dealer.

The basis for allowing imports for the first six-monthly period of this year was that of the amount imported for the same period in 1938, and, in general, no licences are issued for imports over this amount, while cuts are made in particular classes of goods according both to their country of origin and to the possibility of their being made in New Zealand.

TABLE 4.—GROWTH IN CONSUMERS, DEMAND AND GENERATING PLANT COMPARED (1920 = 100)

Year	Consumers	Units generated	Generating plant
1920	100	100	100
1926	330	350	280
1936	610	1,000	710
1938	664	1,260	844

Effect of Restrictions

The New Zealand electrical industry is finding considerable difficulty in adjusting itself to conform with the new regulations. The question of tenders and contracts in particular becomes a most involved one.

The restrictions will fall most heavily on classes of electrical goods which can be manufactured in this country, such as insulators, electric ranges, radio sets and electrical accessories as well as "luxury lines" such as refrigerators, washing machines, food mixers and vacuum cleaners. Heavy electrical equipment, however, generating machinery and distribution apparatus, especially that supplied by English manufacturers, will probably be little affected.

It is too early yet, of course, to determine the precise effect of the restrictions on the quantity of electrical goods entering the country. The latest Customs returns available, those for January, 1939, show no appreciable change from those for the preceding months. In round figures, the monthly imports of electrical and allied apparatus total a quarter of a million pounds (New Zealand currency).

It is very likely that any reduction in domestic electrical appliances will be more than offset by the increased demand for heavy electrical equipment resulting from the increased industrial extensions aggravating the shortage of bulk power in the very near future. The prospects, therefore, are bright in so far as English electrical manufacturers of generating and distributing equipment are concerned.

Automatic Telephony

THE second volume of "Telephony" by T. E. Herbert, M.I.E.E., and W. S. Proctor (pp. 738, figs. 443; Sir Isaac Pitman & Sons, Parker Street, Kingsway, W.C.2; price 20s.), which has just been published, deals with automatic systems.

The authors of this volume have set out to give an exhaustive account of the step-by-step system of automatic telephony as employed in this country, such that, together with Volume I—which deals with manual switching systems and line plant—a detailed exposition of the telephone system of the British Post Office is made available. In addition, details of other automatic switching systems are given to bring out fundamental differences in design.

The introduction, dealing with automatic switching principles, and Chapter 2, describing the elementary principles of the step by step system, should prove of material assistance to beginners.

Subscribers' apparatus used in automatic areas and the various relays and mechanisms commonly employed at automatic exchanges are then dealt with. Descriptions of the P.O. standard uniselector, 3,000 type and 600 type relays are included, although the section on the latter could have been expanded to advantage. The more recently standardised 2,000 type selector is dealt with in Appendix I.

Many Drawings

Both in the chapter on switching employed in the non-director system (including satellite working), and subsequent chapters where circuit diagrams and descriptions are given, the student will gain considerable assistance from the method of relating the facilities provided to the circuit operation, and from the inclusion of numerous basic circuit elements. It is unfortunate, however, that the latest standard graphical symbols, while included in an appendix, are not universally employed in the well executed circuit diagrams.

Later chapters deal with the principle of the "director" system as employed in the larger cities in this country, with details of the switching circuits, and coded call indicator working. The one on the facilities provided by the various types of "UAX" in use in this country includes complete circuit descriptions of the "UAX's" 5 and 12, but its value would have been enhanced by the inclusion of trunking arrangements and circuit descriptions for "UAX" 13 and 14. This would also have had the advantage of providing an indication of the differences in circuit design associated with the 2,000 type selector.

To indicate the comprehensive nature of this work, chapters are also included on intercommunication between manual and automatic exchanges, miscellaneous circuits, power plant, trunking and grading, maintenance, Siemens' No. 16 system, the relay system, revertive impulse systems, and developments in switching systems.

The work is well produced, and contains a large number of illustrations and diagrams, and should prove of great assistance to students of telephony. It should also be of value to communication engineers generally, particularly those interested in the British Post Office system.—H.E.W.

WATER SOFTENING

Its Application to Boiler Make-up and Boiler Feed Waters

By F. Kenyon, A.I.C.

ALTHOUGH the principles of water softening have changed little over the years the design of softening plants has improved considerably. The technology of the lime-soda softener has long been understood and apart from improvements in coagulation and prevention of "after-softening," little need be said here about the actual chemistry involved. In the first place it is generally better to use hydrated lime rather than quick lime, because the former can now be obtained as a consistent chemical commodity, is easier to handle, and gives better softening results.

In the design of water-softening plant the addition of the correct quantity of chemical reagents is not so much left to chance these days—it is altogether more positive, and little trouble need be anticipated in this direction. One criticism of the general design of the lime-soda softening plant, however, is that it lacks flexibility under certain conditions. The general practice is to provide an aqueous mixture of so much lime and soda ash and, separately, some reagent in solution to promote settling. Both these liquids are in sufficient quantity to supply the softening plant for a number of hours. The relative amounts of lime and soda in the mixture, as well as the quantity of the reagent in the settling solution, are decided from considerations of the chemical analysis of the water to be softened; the actual amounts of the reagents added are usually controlled automatically by the quantity of water entering the plant.

Adjustment for Water Changes

The quantities of added reagents can be adjusted if the total hardness of the water to be treated changes. This scheme works excellently provided there is no serious change in the calcium-magnesium ratio of the supply water. If this ratio materially alters (and it does in many waters), the ratio of lime to soda-ash addition must be varied, but this cannot conveniently be done until another set of reagents is prepared.

A suggestion, therefore, is to have a third and smaller tank as well as the lime-soda and settling reagent tanks, not as part of the automatic reagent-addition control, but just for hand feeding a solution of soda-ash into the softening chamber. This would give more flexibility and allow the ratio of lime-soda addition to be varied at will, giving a good start in counteracting variations of magnesium content in the water to be treated.

It might be mentioned here that the removal of permanent hardness due to magnesium salts necessitates the use of both soda-ash and hydrated lime, whereas permanent hardness due to calcium salts requires only soda-ash for its removal. It is also of importance to note that temporary hardness due to magnesium bicarbonate, requires twice the amount of hydrated lime for its removal from a water as does the equivalent amount of temporary hardness due to calcium bicarbonate. When, therefore, variations occur in the calcium-magnesium ratio in the water to be softened, efficient softening requires such arrangement as detailed above.

Rapid Variations

These notes, by the way, deal purely with lime-soda softeners where the reagents are added to the reaction chamber in the liquid form. A plant designed to receive solid softening reagents would better cater for the variation under discussion. In one case in my experience, the magnesium content of a town-main water varied periodically from 0 to 10 gr. per gal. calculated as calcium carbonate within a few hours. The total hardness in the same water was also known to vary over the range 22 to 40 gr. per gal. in the same period of time.

Apart from such periodical rapid fluctuations, little change occurred in the hardness-forming constituents of this water and the yearly analysis of the tests carried out usually gave the following results, calculated as gr. per gal. calcium carbonate: Temporary hardness 15 to 22; permanent hardness 0 to 18; total hardness 15 to 40; calcium content 15 to 30; magnesium content 0 to 10; sodium bicarbonate (as $NaHCO_3$) 0 to 10. The lime-soda plant treating this water was a cold-process type, and with continuity of supply essential, it was well-nigh impossible to obtain efficient softening during the periods of rapid variation, until the operation of the plant was modified by the installation of a separate soda tank.

Sodium aluminate is excellent as a coagulant whilst the magnesium content of the water to be treated is fairly high, but it is not so efficient if the magnesium content is less than 3 gr. per gal., when filtering problems may arise with wood-wool. Care will, therefore, be necessary in the control of sodium-aluminate addition, during periods of magnesium variation in the hard water. This question of coagulation in a lime-soda softener should be considered in conjunction with cost, the degree and type of softening aimed at, and the type of filters used.

Sodium aluminate is more expensive than alum, but it can help the softening process both as an efficient settling agent when magnesium conditions are correct, and also as a softening chemical resulting in a softer water than if alum were used. Under the conditions mentioned, the soft water from the alum treatment should have a hardness of about 3 gr. per gal. together with fairly good settling and from aluminate between 1 and 2 gr. per gal. with better settling, thus reducing the duty imposed on wood-wool filters. Alum on the other hand, does not act as a softening chemical, and requires lime and soda-ash before it can function as a settling agent.

Where a hardness of about 5 gr. per gal. would meet the demand, then alum would be the obvious chemical to use. When, however, it is essential to force the hardness down, sodium aluminate would be a great help. It would not merely give a low hardness in the softened water, it would do this with less softening chemicals and thus allow of a reduction in the excess alkalinities in the softened water, which in some instances is desirable. There is good evidence also that sodium aluminate diminishes the possibilities of "after softening," which is due to magnesium salts in colloidal solution. Soft-water storage tanks are kept almost free of deposit when aluminate is functioning efficiently.

The hot process lime-soda softener, when other things are equal, will achieve better softening than the cold process, and is sometimes employed for softening a water to be subsequently used as boiler make-up without further treatment. Such a scheme is usually a matter of local economics—the cost of steam and/or the desire of a hot or warm softened water, for instance. Unless the former is cheap and the latter required, it is doubtful whether the hot has any relative material advantage over the cold process.

Settling Period and Filters

Generally speaking it is good policy to have a six-hour period of settling in a lime-soda plant. This is especially so if variations are anticipated in the hardness-forming constituents in the water to be treated, and if a wood-wool filter is part of the equipment. One is assuming, of course, that the plant would be run to capacity and that it would be more or less in continuous operation. The desirability of having two settling tanks should also be considered. Instead of having one tank to give the requisite period of settling, two tanks of half the capacity correctly incorporated in the lay-out, would allow of more flexibility for repairs.

The selection of wood-wool for filters is a matter of some importance, not only in respect of its mechanical strength, but also on account of its possible resinous content. In a cold process lime-soda softener of 15,000-gal. per hr. capacity, the wood-wool was replaced by new of the best quality recommended by the makers of the plant. Within a few hours of the softening plant going into service again, all the evaporators which were being fed with the softened water began to prime violently.

Even on half duty, a certain amount of priming took place, and it was nearly a fortnight before conditions became normal again. In spite of internal water conditioning of the boiler plant, several water-wall tubes were lost. The cause of the trouble was undoubtedly the resinous material in the new wood-wool, and at a later date a cheaper variety was treated with steam and hot water before being put into service. This removed the resinous matter, but probably the strands of wood were weakened by this treatment because their life was comparatively short.

Wood-wool filters can also be a source of trouble when things go wrong in the softening and coagulating processes, and a pressure filter is often more economical and more efficient. The filtering medium for a pressure filter should be chosen in conjunction with conditions existing in the plant generally. If a certain amount of silica in the softened water is considered

a disadvantage, then sand should be looked upon with suspicion. Where boiler steam "carry-over" and turbine-blade fouling is occurring, silica from the boiler may be deposited on the turbine blades.

Silica can and is being abstracted from sand filters, which undoubtedly give good service in many directions, but are not always as innocuous as they appear. Graded marble is a suggestion for a filtering medium when sand is considered unsuitable, and although the latter is harder, marble has a comparatively long life in this type of filter. The above details are concerned entirely with filtering a cold softened water; if it be hot, probably the amount of silica dissolved from a sand filter would be increased.

Control of Softening

When softened water is required for boiler make-up and is not to be subjected to further treatment, its alkalinities can often be arranged to cater for a desired type of boiler-water treatment. For instance, when a carbonate-sulphate ratio is required in the boiler water to guard against sulphate scale or caustic embrittlement, this can be effected, in part at any rate, by control at the water softener.

The usual spot determinations may consist of alkalinities and hardness, the latter by means of the froth-soap method. This combination of tests is easily and quickly carried out, and more often than not efficient softening results from the information thus obtained. Generally speaking the froth method gives low hardness values, and whilst this discrepancy in some cases may not be serious it may be enough to interfere with efficient softening, particularly when there is a fair magnesium content in the hard water.

During a long series of tests it was ascertained that when the total hardness of a water was 16 to 18 gr. per gal. and the magnesium content 1 to 2 gr. per gal. the difference between the froth and the palmitate methods of hardness determination was insufficient to cause any trouble in softening. When the total hardness of the water was of the order of 25 gr. per gal. and the magnesium content 6 to 8 gr. per gal., then the froth method was not sufficiently accurate for control purposes.

With the above conditions the palmitate method was always about 2 gr. per gal. higher than the froth method, and this was confirmed by reference to calcium and magnesium determinations. In some cases therefore, it may be advisable to rely on the palmitate method for controlling the softening process, and perhaps just to use the froth method for quick approximate information.

Quantities of Reagents Needed

The amounts of lime and soda-ash required for softening can be calculated from a complete chemical analysis of the water which should be made occasionally as a check. Theoretical quantities of chemicals found by calculation are seldom sufficient in practice to soften a water efficiently. The actual amounts required can be conveniently ascertained from a partial analysis of the hard water and reference to one or other set of factors.

One formula which has given reasonable results in practice is the following:—

(P.P.M. alkalinity as $CaCO_3 \times 0.44$ + P.P.M. free $CO_2) \times 0.0168$ + (P.P.M. total hardness as $CaCO_3$ − P.P.M. Ca as $CaCO_3) \times 0.00745$ = lb. hydrated lime per 1,000 gallons of water.

(P.P.M. total hardness as $CaCO_3$ − P.P.M. alkalinity as $CaCO_3) \times 0.01081$ = lb. soda ash per 1,000 gal. water.

Here again the quantities obtained are usually only approximate, but they will serve as a good starting-off point with, say, 10 per cent. excess hydrated lime and 40 per cent. excess soda, the additional quantities depending upon the type and degree of softening aimed at.

In order to ascertain quickly the lime and soda required to soften a water mix measured portions of clear hydrated lime water (of known strength) and the water to be tested, and boil out of contact with air; after cooking, make up to the original volume with distilled water and filter quickly. Then find the amount of hydrated lime remaining in a portion of the filtered solution, by titration with standard hydrochloric acid using methyl orange as indicator. Calculation will then give the theoretical amount of lime required for a given quantity of the hard water.

To the above neutralised solution add a known excess of standard sodium carbonate, boil, cool and make up to a known volume with distilled water. Filter off a measured volume, titrate with hydrochloric acid and thus find the excess sodium carbonate remaining. All the data are then available for calculating the amount of soda required for a given volume of water.

Finally, useful information and a close check on the process of softening may be obtained by working out a few averages and costs on a weekly basis. A scheme such as in the accompanying chart is suggested:—

	Week ending	Averages and totals to date
Water treated (gal.):		
Gross		
Loss due to sludging, flushing, &c.		
Net		
Chemicals used (lb. per 1,000 gal. gross):		
Lime		
Soda		
Coagulant		
Average hardness (gr. per gal. $CaCO_3$):		
Hard water		
Softened water		
Cost of softening (pence per 1,000 gal. net):		
Softening chemicals		
Operation wages		
Maintenance of plant		
Total		

Any other items which may be helpful in the control of the plant may be added and some of the more important items may be recorded in graph form.

The base-exchange process of water softening, also known as the zeolite process, is capable of producing water of zero hardness,* but it does not remove the acidic radicles, which remain unchanged in the softened water. For instance, the bicarbonates of calcium and magnesium, which cause temporary hardness, are converted into equivalent amounts of bicarbonate of sodium. This point is of some importance in considering this process for boiler feed and/or boiler make-up water supplies. Waters containing bicarbonate of sodium generally have corrosive tendencies towards iron and mild steel, especially when hot, and it should also be remembered that this substance slowly liberates CO_2 when boiled at low pressures, leaving carbonate of sodium in solution. At higher pressures the latter would liberate a further quantity of CO_2 and be converted into caustic soda.

The evaporation of a zeolite-softened water may produce an acid distilled water and evaporator priming. In high-pressure power plant where difficulty is experienced in lime-soda softening the boiler make-up water before evaporating, it may be economic to sandwich a base exchange softener between the lime-soda treatment and the evaporator. In this case it would be necessary to ensure that the water entering the base exchange softener was clear and free from suspended material. It would also be disastrous if the lime-soda treated water proceeded to "after-soften" itself among the base exchange material.

*1. Water Softening. The Base Exchange or Zeolite Process. Water Pollution Research. Technical Paper, No. 1. Price 6d. 2. Report of the Water Pollution Research Board. Year ended 30th June, 1935. Price 1s. Both published by H.M. Stationery Office.

Transport Congress

THE twenty-ninth annual congress of the Tramways, Light Railways & Transport Association is to be held at Blackpool from June 7th to 10th. Leaving London at 10.40 a.m. on June 7th delegates will be received by the chairman of the Council, Mr. T. E. Thomas, in the evening.

After an official reception by the Mayor of Blackpool on the morning of June 8th the annual general meeting will be held. This will be followed by a paper on "The Place and Function of Communal Transport in the Social and Economic System" by Mr. W. Luff, general manager of the Blackpool Transport Department. In the afternoon there will be a drive along the promenade and tea at Fleetwood. The day concludes with a dinner and dance at the Winter Garden.

On June 9th a paper on "Ticket-issuing Machines" will be read by Mr. G. H. Brooks (L.P.T.B.) and there will be a luncheon at Prescot at the invitation of the English Electric Co., Ltd., followed by a visit to the company's works. The annual dinner, dance and cabaret will be held in the evening. Delegates will return on July 10th, special coaches being provided.

University Scholarships

THE Manchester Education Committee offers a limited number of scholarships and exhibitions tenable in any one of the three years' full-time day courses leading to the degree of B.Sc.Tech. at the Municipal College of Technology (Faculty of Technology in the University of Manchester).

In the event of there not being sufficient Manchester students qualified to enter upon a higher course, and only in that case, the Committee may offer the scholarships to suitably qualified students who have no ratepayer qualification, but exhibition candidates must be ratepayers, or children or wards of ratepayers, of the City. All information may be obtained by written application to the Registrar, College of Technology, Manchester, 1.

LOAD-DURATION CURVE

Predicting Optimum Running Conditions

By R. C. Golding, M.Sc.(Eng.), A.M.I.E.E.

STATISTICAL analysis of station operation is a necessary adjunct to obtaining maximum efficiency, since the results can be applied to future operation with a view to determining a bogey, towards which effort can be directed in an endeavour to obtain still lower costs of operation.

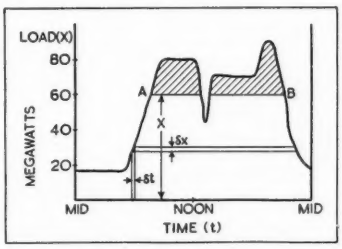


Fig. 1.—Daily load curve

The prediction of the average load on a set during a future year is important, since it may be found that the purchase of a larger set for base-load operation would result in economy, or the number of kWh to be generated which lie above a certain load may be required in order to determine the advisability of major maintenance on a piece of plant used solely for peaks. The uses of a study of load in relation to time are legion, and the load-duration curve offers a simple means of obtaining most of the information desired.

A normal load curve for a day's operation by an undertaking having an industrial load predominating, is shown in Fig. 1, in which 60 MW or over is held for approximately thirteen hours; the shaded area gives the kWh to be generated above 60 MW to some predetermined scale.

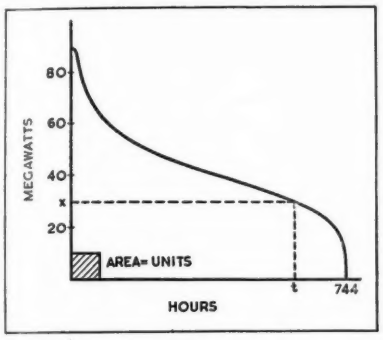


Fig. 2.—Load-duration Curve

If x equals the load at any time, then the load x endures for a period of time which can be read from the graph as at A B. If the graph be split into a number of load strips δx and each is designated by a suffix, while t represents the time during which this load endures, then δx_1 endures for t_1 hours, δx_2 endures for t_2 hours, &c.; but $\int_0^{Max} t\delta x$ = area below the curve which represents kWh generated during the day. Now $\int_0^{Max} x\delta t$ also equals the same area and provides a simple method of constructing a load-duration graph.

To obtain the necessary data load readings are taken every hour or half-hour. These should be obtained from integrated kWh adjusted for the time period rather than from indicated scale readings, as this will give a more accurate estimation of the kWh. The oftener readings are taken the more accurate will be the resulting graph.

Table I

LOAD GROUP MW	18-20	20-22	22-24	24-26	ETC
1 ST. WEEK	III	𝍸 II	II	𝍸 𝍸 I	
2 ND. WEEK	I	III	𝍸	𝍸 I	
ETC					
TOTALS	4	10	7	17	

The second step is a preparation of "unit sheets" divided into columns of load groups representing approximately 2 per cent. of the maximum load to be dealt with. More detailed groups will, of course, give greater accuracy; larger grouping will be found to give serious errors.

The load readings taken are then scanned and a "unit" placed in the appropriate column of the unit sheet, *e.g.*, 12,500 kW will be noted as a reading in the 12 to 14 MW column, or 10 to 15 MW, as the case may be. When the whole period under review has been dealt with in this manner, the columns are summed and the number of readings in each load group obtained. Table I gives an illustration of the completed form.

The data thus obtained is transferred, as a third step, to a summary sheet for which the following information is required:—Average load in each group; number of hours during which the load in each group endures; and total number of hours under review. The summary sheet then assumes the aspect of Table II.

Column 1 shows the group divisions as taken from the unit sheets and Column 2 the average loadings of these groups. For all but two groups of the graph, noted by an asterisk, these can be taken as the load mid-way between the dividing loads, *e.g.*, the average of a group 30 to 35 MW can be taken as 32.5 MW. Some error is introduced in the first and last group in which readings occur; in the highest the mid-load is too high, but as there are few readings in this group the error is negligible. The actual average of these readings can, however, be obtained by summing if desired. In the lowest group many more readings will usually be found, and for reasons depending on developments from the load-duration curve, the true average of this group should be obtained by summing. This will entail noting these readings when scanning the original load readings.

Table II

① LOAD GROUP	② AVERAGE LOAD	③ Nº OF READINGS	④ HOURS	⑤ CUMULATIVE HRS. REV.
18-20	19·8*	4	2	744
20-22	21	10	5	742
22-24	23	7	3·5	737
ETC				
84-86	85	64	32	57
86-88	87	40	20	25
88-90	88·4*	10	5	5

* SEE CONTEXT

Column 3—the number of readings in each group—can be inserted, and Column 4 derived therefrom depending upon the frequency of the readings. For example, if forty half-hourly readings occurred in a single group then that load endured for twenty hours.

Column 5 is completed from the bottom upwards. If the highest load group has endured for 5 hours, the next 20 hours, and the next 32 hours, then the load has been equal to or exceeded the penultimate group for 20+5 hours, and the 3rd group for 32+25 hours, and thus Column 5 is completed up to the lowest group. Since this group endures throughout the whole period, the final figure in Column 5 should equal the total hours reviewed.

Figure 2 shows the final stage—the load duration curve itself. The ordinate is load, while the abscissa represents time. The curve is obtained by plotting the readings in Columns 2 and 5 of Table II. The area beneath the final curve still represents $\int_0^{Max} x\delta t$ but the time entities for each load reading have been summed and arranged in descending order. It is thus possible to read from the graph that any load x persists for t hours, while the kWh generated above or below this limit are obtained directly from the area and the corresponding scales.

With practice, the process is far from laborious. Two hours of a girl clerk's time per day have been found ample to keep the record for loads of up to 500 MW, entailing the addition of some seventeen readings, forty-eight times per day. To prepare the curve for an undertaking with a kWh summation meter the time spent is negligible, since the unit sheets can be prepared as the loads are noted; further calculations only occur at the end of each period reviewed.

Fusegear Modernisation

HAMMERSMITH Electricity Committee reports that there are approximately 10,000 cut-outs of the old cast-iron type in use on consumers' premises which are not provided with withdrawable fuse bridges and the fuse wire has to be fixed on live terminals. In co-operation with British Insulated Cables, Ltd., a suitable modification of the standard high-rupturing capacity fuse has been evolved which can be installed in existing cut-outs, and it is proposed to replace the old fuses with these at a total estimated cost of £883.

MEETINGS AND DISCUSSIONS

Operation of Audio-frequency Equipment at Alexandra Palace. Effects of Welding on Ship Design. Survey of Iron and Steel Production Methods

Television Sound Equipment

A GENERAL description of the Marconi-E.M.I. audio-frequency equipment supplied to the British Broadcasting Corporation for use in the London television station at the Alexandra Palace was given in a paper by Messrs. I. L. Turnbull and H. A. M. Clark (Electric and Musical Industries, Ltd.) which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 3rd. Design features necessary to satisfy high quality sound requirements were indicated and data included to show that the performance in this case was probably better than that commonly obtaining at many high-grade broadcasting stations.

In the authors' opinion, the low odd-harmonic distortion (and intermodulation) level at the low frequency end of the scale was probably even more important than the extension of the frequency range in the upward direction. The requirement of a very low distortion level at low frequencies was undoubtedly the most difficult part of the specification to satisfy.

Complete mains operation, including the use of AC for valve filament heating, was perfectly feasible, even for first-stage amplifiers following insensitive types of microphones; no batteries of any sort were employed.

The cut-off at each end of the frequency range had purposely been made gradual rather than sharp, and this had led to a number of practical difficulties. Considering first the low-frequency end, the most marked of these had been the question of fluctuation of anode voltage. Without the use of the stabilising circuits referred to in the paper it was doubtful whether it would have been possible to maintain the overall gain so level at the extremely low frequencies.

Interfering noises such as studio rumbles and microphone boom noises were much more prevalent with an extended low-frequency range, and it remained to be seen whether the practical limitation had been reached.

At the high-frequency end of the spectrum background hiss became more marked with the extension of the range; a large part of this arose from acoustic sources. That the practical limit had been already exceeded in this direction in connection with recorded sound was well known.

After being in service for two years, the equipment appeared to have fulfilled the desiderata, somewhat uncertain at the outset, for a single-studio television station. All the facilities included had been of value at some time or other, while if there was any error in the original specification it appeared to have been more in the nature of an under-estimation of the number of channels required, than the reverse.

All-welded Ship Design

THE major considerations which confront the designer of an all-welded ship were briefly set out in a paper by Mr. J. P. Wadling (Swan, Hunter & Wigham Richardson, Ltd.), which was read before the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-on-Tyne on April 21st.

The author, being responsible for the detailed design and experimental work associated with the development of electric welding at Wallsend-on-Tyne, was able to emphasise the necessity for a revision of the structural design and constructional processes involved.

The paper contained a critical analysis of the effects on design of the practical application of arc welding and the limitations imposed by the plant available. Details of the principal changes from the riveted design were indicated and illustrated in the paper.

The author advised the designer to avoid at all costs any tendency merely to copy methods and arrangements which had been found suitable for riveted construction as such, and he must exercise ingenuity in designing arrangements suitable for welding. He must not overlook the fact that shipbuilding was, largely, rather of the nature of an art than an exact science, and care must be taken that the lessons of experience were not abandoned in an endeavour to facilitate welding processes in themselves.

It should never be forgotten that all joints and sections had to be positioned in such a way that the welding operation itself could be executed under the best conditions. This meant that the welds must be convenient and accessible and preferably in a horizontal (down-over) or vertical plane. The lifting capacity of the cranes available had a very important bearing on the efficiency and ultimate cost of the work, so one should endeavour to preconstruct the structure in the heaviest units or the maximum size that could be transported in one lift.

Iron and Steel Processes

A LONG list of special reports and papers was presented at the annual meeting of the IRON & STEEL INSTITUTE in London from May 3rd to 5th.

The Ablett Prize paper by Mr. H. Escher described ten years' development in steam engineering at the Port Kembla steelworks, N.S.W., Australia. Steam generation was dealt with first, then boilers fired with blast-furnace gas and the introduction of pulverised fuel, with centralised combustion control from instrument boards from which the starting, stopping and regulation of motors were effected by push-buttons. The power consumption for cleaning blast-furnace gas in Theisen washers was 0.13 kWh per 1,000 cu. ft. of gas.

A saving of nearly 300 HP, as well as in maintenance, was effected by driving the induced draught fans by variable-speed AC motors, slip-ring type with rotor resistance control in 9 to 16 steps.

The increasing employment of electric drives in the rolling mills had gradually reduced the uses of steam, outside the power house, which contained one 2,400-kW, two 5,000-kW and one 12,500-kW sets operating at 3,000 RPM, 6,600 V, three phase, 50 cycles. Steam temperature was being raised to 750 deg. F., the pressure was 250 lb. per sq. in. and auxiliary power had been reduced to 1.5 kW per 1,000 lb. of steam. Turbine bleeder connections enabled up to 50,000 lb. per hour of low-pressure steam to be extracted for a hot-boiler-water storage system to even out fluctuations in the total steam load.

The blooming mill was driven by a 6,000 to 18,000 HP electric motor having a maximum speed of 150 RPM. The finishing mill was steam driven and two other steam mills had been removed to make place for a modern electric mill having seven continuous roughing stands and six finishing stands, also electrically driven.

Improved Rolling Methods

The rolling of sections by the Appleby-Frodingham Steel Co., Ltd., was dealt with in a paper by Mr. W. T. Wilson (Scunthorpe), who was chiefly concerned with improved methods of operation. Brief descriptions of plant included references to such electrical items as screw-down gear and pyrometers for the cogging mill; roller trains for the reheater charger, and pushers for effecting cross-over from one stand to another on either side of the finishing mill.

To provide cold-straightened bar as the normal mill finish the undermentioned plant, which was said to be unique of its kind in England and Europe, was claimed to have more than justified its installation.

Immediately beyond No. 2 hot-saw was a travelling bar stopper driven by a 25-HP reversible motor, giving a top speed of 300 ft. per min., while by means of an electrically operated change gear the speed could be instantly changed to 60 ft. per min. for fine adjustment.

Behind the hot-saw and leading to the mechanical bank was a roller train about 250 ft. long consisting of thirty-three individually driven rollers with a peripheral speed of 500 ft. per min. Below the floor plates were mounted nine stoppers which were lifted into position by electrically operated thrustors. The sawn bars were pushed from the roller train by fingers, which were ambushed on the return to clear oncoming bars, each finger being controlled by its own solenoid.

At this stage, joists and channels were turned up on to their flanges by turn-up elements arranged opposite each section of the cooling bank; other sections, such as angles and flats, were left in the as-rolled position. A second movement of the push-off gear removed the turn-up bar to the main conveying system at the same time as the following bar was being positioned over the turn-up gear. The time cycle was five seconds. The bank was divided into six sections, adjacent sections being coupled together automatically when specially long bars were being cut at the saw.

On the outgoing side of the bank the bars were turned

down and pushed on to a roller train which fed direct into two roller-straightening machines, each having a two-speed gear driven by a variable-speed motor, the range of delivery speeds being 164-394 ft. and 108-197 ft. per min. for the small and large machines, respectively.

Over the cold bank, with track at right-angles to the travel of the bars, was a 7½-ton overhead crane with a span of 130 ft. and of almost all-welded construction provided with motor-driven extensions to the beam to facilitate the handling of long bars.

Into the 15-in. mill blooms and billets were charged by an electrically driven pusher. The mill had four stands—roughing, strand and ovals—which were three-high, and a guide stand, two-high, all driven by a 750-BHP motor running at 90-160 RPM.

Spectrographic Analysis

Metallurgical analysis with the spectrograph at the Naval Ordnance Inspection Laboratory, Sheffield, was dealt with in a paper by Mr. F. G. Barker, who showed that by employing spark spectrograms and photo-electric methods of evaluating them it was possible to make quantitative determinations of several elements with an accuracy closely approaching that obtainable by chemical analysis.

For examining iron and steel a large instrument was essential to provide a spectrum length of about 30 in. Apart from its optical portion, the electrode stand was adjustable, operated at about 120 V, DC, and had a regulating resistance in series with the arc.

The sample under examination served as one electrode, and for the other a machined rod of the same metal, or a rod of graphite, or any spectroscopically pure metal could be employed, the selection being dependent on the type of metal or alloy under examination. For example, when copper or copper alloys were being examined, a rod of pure copper was used as the other electrode. Similarly for steels examined by the arc method, a rod of pure iron was used.

Some workers claimed that the greatest sensitivity was obtained when both electrodes consisted of the sample under examination. This practice might be desirable when a search was being made for minute quantities of elements, but the author found that for most purposes any slight advantage which the method might have was more than offset by the large amount of work involved in machining electrodes.

The polarity of the sample was of some importance; the alloy under examination should be made the negative pole, because the impurity lines had then an intensity approximating to that obtained when both electrodes were of the same material. If a sample was too small or of too low a melting point to be used as an electrode itself, it was placed in a crater freshly prepared in a graphite rod.

Besides photographing the spectrum by means of a DC arc, the author had also used an AC spark produced by a transformer with a condenser (optimum capacity 0.005 μF) in parallel, together with an optional tapped induction coil in series with the high-voltage current. A very distinct improvement in results was obtained by substituting a rod of graphite for the pure iron electrode when the spark method was employed.

Exposures of less than a minute sufficed for photographing spectra and for examining them the author said he had found the Adam Hilger photo-electric microphotometer of great value. This principle of density measurement was the same as that underlying visual comparison, but this method left nothing to personal judgment.

Magnet Alloys

A paper by Dr. W. Betteridge described how variations of the magnetic properties and the optimum conditions for the heat treatment of nickel-iron-aluminium magnet alloys had been investigated in the laboratories of Joseph Lucas, Ltd., showing that the presence of carbon was very deleterious This paper also contained an account of investigations by X-ray diffraction methods into the cause of the high coercivity of these alloys.

A paper by Drs. C. Sykes and F. W. Jones (Metropolitan-Vickers Electrical Co., Ltd.) mentioned that for investigating the possibility of changes in iron and steel occurring during the temperature interval from 50 to 400 deg. C. previous workers had determined the rate of change of electrical resistance with temperature. The present authors showed that the discontinuities in the temperature coefficient over temperature intervals of 3 deg. C. were of the same order as the experimental error, namely, ±2 per cent. They thought that the residual discontinuities were spurious but that they might be eliminated with improved technique.

Part II of a paper (Northern Coke Research Committee) by Messrs. H. E. Blayden and W. Noble and Prof. H. L. Riley (Newcastle) showed how the properties of coke were affected by the conditions it was subjected to while it was being carbonised.

The predominating influence was that of pressure and the increase in strength of coke which occurred in the second temperature range began at that temperature at which the coke became an electrical conductor. This was of fundamental significance, for it indicated that at about 650 deg. C. new cohesive forces came into play owing to the liberation of metallic electrons. These new chemical valency forces were probably also responsible for the contraction and consequent fissuring that occurred above 650 C. due to border carbon atoms of the layer planes of the carbon crystalites becoming progressively less saturated, as indicated by X-ray studies.

Tesla Coil Experiments

FOR the concluding lecture of another successful session of the ENGLISH ELECTRIC (STAFFORD WORKS) ENGINEERING SOCIETY the lecturer was Mr. J. B. Kramer, M.I.Mech.E., M.I.E.E., who took for his subject "Experiments with the Tesla Coil." Mr. J. Rogers was in the chair and the large lecture hall was filled to capacity.

Mr. Kramer dealt with electrical oscillations of very high voltage and frequency. During the demonstration his assistant, Mr. A. D. Horton, was seated on a chair inside a full-sized model of Faraday's Cage, kindly lent by Sir William Bragg, President of the Royal Institution. The cage was charged up to a very high potential by a frictional electricity machine. It was shown that whereas it would be dangerous to touch the cage from the outside, the person inside could not feel any sensation whatever.

After the lecture, which was illustrated with lantern slides, there was an interesting discussion. At the conclusion of the meeting Mr. Rogers referred to the excellence of the short papers read during the session, and Mr. Hollander presented prizes to Messrs. W. A. Adams, A. Asbury, B.Sc., W. M. Colles, B.A., K. O. Goodwin, B.Sc., J. G. Grant, B.Sc., and D. B. Welbourn, B.A.

Electrification by Impact

AMONG the several papers presented and demonstrations witnessed at the April 28th meeting of the PHYSICAL SOCIETY in London was one in which Sir Ambrose Fleming described a new method of creating electrification.

The fundamental fact to be noticed, he said, was that when certain insulating materials, the best of which appeared to be pure silica (SiO_2), in a certain state of fineness of powder were allowed to fall down a tube and strike a metal plate perforated with small holes, or a metal wire gauze of zinc, copper, nickel or iron, the metal plate became electrified positively and the insulating powder negatively.

The powder, which might be silica, sulphur, silver or river sand, or certain other materials, must have grains of nearly equal size and must be dried so as to be free from all moisture. Also the size of those grains must be such that they would fall through the apertures and not accumulate on the metal. To obtain the best effect the powder must strike the perforated plate with a certain velocity, as it was this blow which created the electrification.

The material of the tube down which the powder fell had no effect on the result; it could be brass, iron, glass or ebonite. This showed that the effect was not due to friction of the powder falling down the tube, but to the impact of the particles on the plate. The metal of which the plate was made and the material of which the powder consisted affected the potential to which they were electrified as regarded amount but not sign.

To enable a small quantity of the powder to be used over and over again without waste or loss, two canisters could be fixed into the opposite ends of a short and wide ebonite tube having a disc of perforated zinc placed as a diaphragm across its centre. The arrangement was then like an hour-glass with powdered silica in the canister at the top falling down through the zinc diaphragm and collecting in the bottom canister. The apparatus could then be turned over and at each such passage positive electricity would accumulate on the zinc plate and by an external wire connected to the diaphragm the charge could be given up to an electric condenser consisting of two metal plates with a thin layer of ebonite between them. If these plates were separated, their capacity would be reduced and the potential correspondingly raised. One could thus obtain electricity at many thousands of volts.

By a small modification of this arrangement an electrical machine could be made continuously to provide electricity at very high potentials.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Electric Razors in Bathrooms

REPLYING to the letter of Mr. B. Rayner in your issue of April 14th, the solution of the problem seems to be the following:

1.—Fit a transformer of output voltage suitable for direct operation of the razor without its resistance box. Fuse the transformer by means of a fuse box of the Belling-Lee type, with cartridges very close to the transformer rating: the latter need only be about 10 VA. The transformer should, of course, be double-wound and of sound construction, and it seems immaterial whether one pole of the low-pressure side is earthed or not.

2.—Fit a socket outlet, connected to the secondary of the transformer, of a pattern such that the plug on the razor, which normally fits into the appropriate slots in the resistance box, will fit direct into it.

This arrangement would appear to leave the razor available for use anywhere in the house (with resistance box), while it could be used in the bathroom without resistance box. In the latter case it would be isolated from the supply mains and therefore safe, particularly as the voltage applied to the razor is usually 110. At the same time, the bathroom outlet would not be available for general use. In the event of deliberate overloading of the outlet the fuses would protect the transformer.

It is most probable that the socket required to match the sockets in the resistance box would not be a standard article, but these plugs are usually of the flat pin type and it should not be very difficult to make a socket up.

E. H. NORGROVE, B.Sc., Ph.D., A.M.I.E.E.

Birmingham, *April 24th.*

My attention has been directed to Mr. T. C. Gilbert's letter under the above heading in your issue of April 28th, in which he states that a portable washboiler is shown in one of the photographs of the London County Council's Kingsmead housing estate on page 508 of your issue of April 7th.

The washboilers in question are not portable but fixed; the wiring in conduit is run direct into the apparatus and all metalwork is bonded and earthed, complying in every detail with the requirements of the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers.

E. A. MILLS,
Borough Electrical Engineer.

Hackney, E.5, *May 1st.*

Youth or Experience?

The attention of the electrical industry is being directed, somewhat slowly, to the question of unemployment among the older men and women, who in many cases, through no fault of their own, have lost responsible positions and are unable because they are over 45 to secure similar employment when surely their experience should be of the greatest value.

The many amalgamations which have taken place recently have been largely responsible for this very unsatisfactory and lamentable state of affairs, but if the electrical Press could enlist the help and sympathy of the industry much might be done. The writer believes that women are suffering most from what cannot be called "a square deal."

Some women after working for over twenty years in supply companies' showrooms have been asked to resign because of an amalgamation. This is particularly hard, as they have been faced not only with loss of work, but also with loss of pension, to which they were entitled on retirement.

The Electrical Association for Women is deeply concerned with this problem, but does not seem to be able to take any active remedial steps. The Training and Diploma Committee is working hard for the status of the younger women, but it is surely due to the pioneer work of older women that many of the younger women are now filling the worth-while jobs. The housecraft diploma of the E.A.W. has been the "open sesame" to the electrical industry, but before its inauguration women had to fit themselves for their jobs by their own hard work, which allied to their very practical experience, should make them better fitted for some of the positions which many of the younger women are filling.

The reaction of the general public to the personality of the older woman, working in an advisory capacity, is one of confidence. Her years of experience must have developed the faculties of tact and discrimination which are such necessary attributes in any employee working for a public utility company.

SQUARE DEAL.

April 28th.

Age Limits

"Call to men of 45 to 51." That was the shout from the placards last week. This is rather different from the "no one over 40 need apply" that is always tacked on in your "Situations Vacant" columns.

Those of us who served in the last war are apparently not too old to be needed for National Service. What is the electrical industry doing to see to it that there is room, too, in their ranks for men of middle age?

The "too old at 40" complex must go and those whose job it is to employ personnel must give serious attention to the example shown by the Government, and employ older men. There may be a question here concerning the limitations set up by superannuation schemes. If that is so then they must be amended or set aside in the national interest.

To say that half of the staffs of electrical concerns, especially those on the supply side, could easily be replaced by men of middle age is, I think, no exaggeration. I suggest that a register be drawn up at once so that in the event of a national emergency ex-Service men of ability should be available to take the places of younger men needed in another field.

May 1st. RAW DEAL.

Low-voltage Network Protection

The article on page 597 of your issue of April 28th seems to be misleading in some respects. Dealing with a low-voltage fault of 40,000 kVA the authors say that a circuit-breaker should be used to control the transformer owing to the magnitude of this short-circuit kVA. They suggest, however, that high-rupturing-capacity fuses would be sufficient for protecting the low-voltage feeders.

Should a fault develop on the cable box of one of the outgoing low-voltage distributors, the short-circuit kVA experienced will be equivalent to a bus-bar fault and protection will be needed of the same capacity as the transformer low-voltage circuit-breaker. If, therefore, a circuit-breaker is necessary for the transformer, then circuit-breakers are equally necessary for the low-voltage distributors.

Your contributors go on to say that unit-type distributors for low-voltage boards are unsuitable if ammeters and demand indicators are fitted. I may say that in the last eight years this Board has equipped many sub-stations with unit-type distributors and demand indicators as standard practice and it has not been necessary to use panels of marble, which surely is an out-of-date method.

Their suggestion of using a fuse with a coating to arrest or prevent deterioration leaves me rather cold. Surely if the problem is a real one it is better to go the whole hog and convert rewirable fuses to a standard high-rupturing-capacity type without the step they suggest, which I can only regard as an intermediate one. The problem of converting the existing rewirable fuse handles to take h.r.c. fuses is not an insuperable one and we have ourselves converted something like 500 handles in the last two years.

C. CAMERON KIRBY,
Engineer and Manager,
Alderley Edge and Wilmslow Electricity Board.

Wilmslow, *April 29th.*

Steel-cored Copper Conductors

A BRITISH Standard Specification, No. 837, for steel-cored copper conductors for overhead transmission purposes which has just been issued, was prepared at the request of the Copper Development Association. It has been drawn up on similar lines to B.S.S. 215 for hard-drawn aluminium and steel-cored aluminium conductors for overhead transmission purposes, and includes details of dimensions, mechanical and electrical properties and tests for standard conductors with both high and low steel ratios.

Figures for the modulus of elasticity and coefficient of linear expansion are given in an informatory note, and a series of secondary standard sizes is given in an appendix. Copies of this Specification may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

NEW ELECTRICAL PRODUCTS

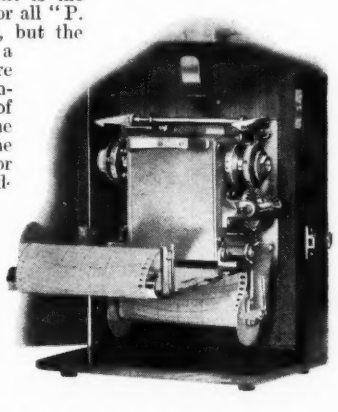
A Review of Equipment Recently Marketed

Portable Load Recorder

A NEW "P. and B." load recorder incorporates a time lag of ten minutes so that the pen moves slowly over the chart even under rapidly varying loads, giving a reading of the average load for the preceding ten minutes.

This method of operation has a number of advantages. For instance, on rapidly varying loads the average maximum and minimum loads are easily discernible, while due to the steady movement of the pen ink is not thrown over the chart.

The essential movement is the same as that employed for all "P. and B." load indicators, but the bi-metallic coil has a higher torque to ensure that the accuracy is unaffected by the amount of ink in the pen and the friction of the pen on the paper. The limit of error is 3 per cent., in accordance with B.S.S. No. 90-1929, for graphic ammeters.



"P. & B." load indicator with the table swung forward in the horizontal position for chart removal

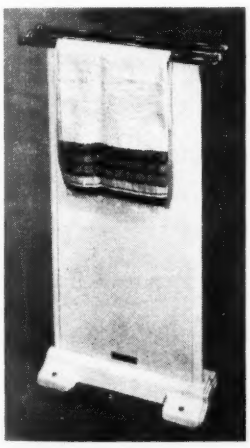
The loading is 5 VA at a nominal full load of 5 A, and the effective range is 1 to 6 A with minor chart rulings of 0.2 A. A continuous roll chart, 65 ft. long and 4 in. wide is fitted, the speed being 0.8 in. per hour. An eight-day clock or a synchronous motor drives the chart. As it is fed forward by the toothed wheels, it is wound on to the lower chart spool by a slipping clutch drive which maintains correct tensioning of the paper.

The makers are the P. & B. ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, Surrey.

Radiator and Towel Airer

A towel airer and bathroom heater of particularly pleasing lines has been introduced by the SYMAX ACCESSORIES CO., 23, Thimblemill Lane, Aston, Birmingham, 6.

The apparatus is built of sheet steel, seamed and electrically welded, with a cast-iron base. The actual tubes which carry the towels are of drawn brass and are mounted in chromium-plated brass brackets.



"Symax" radiator

The element, which is loaded at 500 W, is housed in refractory tubes contained in a sherardised pressed steel container which is again insulated from the main body of the apparatus by refractory insulators. Asbestos covered flexible cable, anchored to mica insulators, connects the element to terminals mounted on a trefoil bakelite block ready for wiring connections to the main, a separate terminal being provided for earthing the body of the equipment.

The heat-resisting white enamel finish and the clean design make the heater suitable also for use in a bedroom, nursery or dentist's or doctor's surgery.

Cold Filling Compound

For situations in which the application of heat for melting compound for joints or terminal boxes is impermissible or when the compound has to be used at a point remote from the source of heat, W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, E.C.1,, has produced a cold-filling compound suitable for paper- or rubber-insulated cables for voltages up to 11 kV.

It consists of a proportional mixture of black compound and hardening agent, which is poured at atmospheric temperature. It has a melting point of 56 deg. C. and a breakdown strength of 32 kV for a 2 mm. gap.

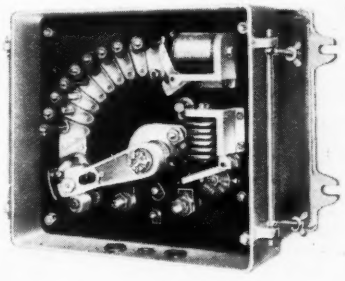
Initial setting commences almost immediately the two constituents are mixed and the compound reaches its final condition as a pitch-like semi-plastic solid in a week or so. The compound becomes too stiff to pour within half-an-hour. As its shrinkage is small, topping up involving several hours' delay is obviated and high-voltage cables can be made alive immediately the box is filled; with low-voltage cables the box can be filled while they are alive. The compound is therefore suitable for use in emergency, *e.g.*, A.R.P. arrangements.

A typical test carried out at Henley's research laboratories was one on two straight-through joints in a 0.1 sq. in., three-core, low-voltage cable employing cold pouring compound. One joint was exposed to rain and sun; the other was completely immersed in a trough of water exposed to atmospheric temperature fluctuations. The period included a hot summer and conditions in which the water in the trough was frozen. "Megger" readings were taken periodically between each pair of cores and between each core and earth. After twelve months' exposure, when readings of infinity were still obtained, the joints were subjected to breakdown tests with satisfactory results.

DC Motor Starters

A series of DC faceplate motor starters is a recent development by the POWER EQUIPMENT CO., LTD., Kingsbury Works, Kingsbury Road, London, N.W.9.

The case is constructed of cast iron and sheet steel for the totally enclosed type, and perforated sheet steel for the ventilated type. The nickel-copper resistances are attached to the back of the faceplate, enabling the whole of the interior to be withdrawn as a single unit, while the faceplate itself consists of ebony grade "Sindanyo" or "Interohm" insulating material. All sizes are fitted with removable segmental contacts of copper, and those intended for full loads in excess of 25A have a spring-loaded carbon roller fitted to the first contact to reduce arcing.



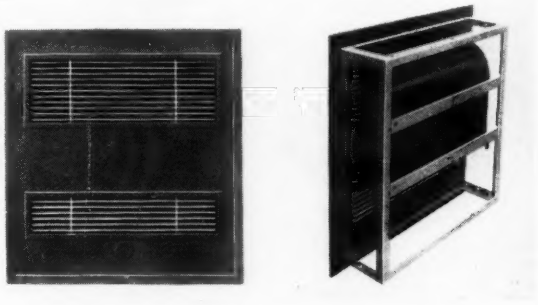
25-BHP 200-250-V starter

Cast iron is used for the contact arm, and the shoe is of solid brass directly spring loaded on all except the largest size, which is fitted with a laminated phosphor-bronze brush to carry the current independently of the arm, and spring-loaded carbon rollers are provided at each contact to reduce sparking. Low-voltage and overload coils are machine layer wound, and the low-voltage hold-over device has an electrically operated trigger to lock the contact arm in place should the starter be mounted in a position subject to vibration.

Steel Inset Connectors

A convector announced by E. K. COLE, LTD., Southend-on-Sea, to supplement the existing range is an all-steel inset type, available in 1-kW, 2-kW, and 3-kW ratings, with optional built-in thermostatic control.

One-piece construction is a feature and no inset fixing-box is required. The heater has a welded angle-iron frame and as the "Thermovent" duct system keeps all surfaces at room temperature it can be directly installed without either rear or side insulation.



Inset "Thermovent" convector; the rear view shows the angle frame

The 14 SWG reinforced front panel is self-registering and flush-fitting, being fixed to the frame by inconspicuous instrument screws. Aluminium grilles of solid section are fitted.

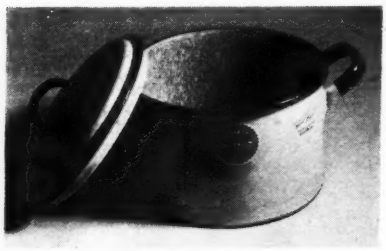
D

The panel is finished in priming grey and can be refinished with any type or colour of paint. This possibility of colour matching, with no danger of wall-blackening or paint flaking, makes the convector suitable for ordinary architectural work as well as for marine and industrial uses.

The absence of radiation enables the heaters to be installed close to machinery or even to be built into benches.

Enamelled Cooking Utensils

A range of Belgian made enamelled cooking utensils with special machined bottoms for use on cooker hotplates is now being sold in this country by PINCHBECK BROTHERS, 35, Friday Street, London, E.C.4.



"Society Brand" saucepan—one of several new utensils

The utensils are made of steel, with 3-mm. thick bases, the reinforcement being carried part of the way up the side of the pan. There are saucepans with end handles and double handles with or without pouring lips. There are also frying pans and kettles available in a number of sizes ranging between 14 and 26 in. in diameter.

Cookers for Hiring

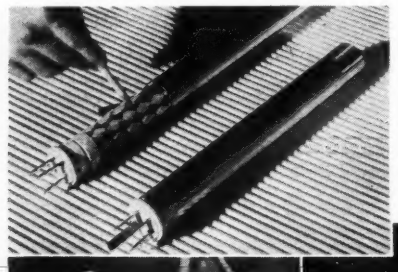
A series of cookers specially designed to be hired out by supply authorities has been introduced by MOFFATS, LTD., Blackburn.

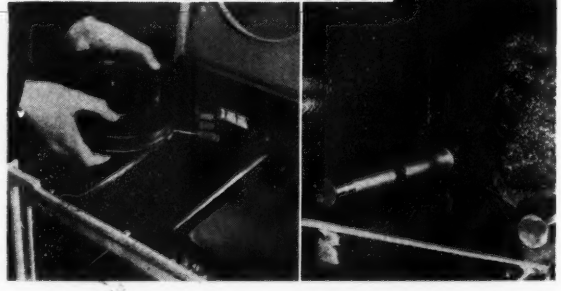
No. 142, which is now in production follows in external appearance the general lines of Moffat cookers, has a net oven capacity of 2,100 cu. in., and is fitted with one boiling plate and a grill boiler. The actual oven measurements are 14 in. wide by 13¼ in. deep by 13¼ in. high.

The unusual method of heating the oven is worthy of special mention. The oven itself is a solid box, welded into one piece, porcelain enamelled and fully heat insulated. Two "Inconel" cylinders with ends facing the doors are mounted at the base, as shown in the illustration. These house the 800-W elements of the plug-in type, flat blade contacts being used, as Moffats are believers in the flat pin contact rather than the round pin.

The loading of 1,600 W gives a wattage of 0.76 per cu. in., and the elements themselves have a low wattage density. To avoid the burning of foodstuffs near the elements easily removable baffles are fitted, while the use of "Inconel" for the element housings prevents corrosion by spilt foodstuffs. The shelf supports are also easily removed for oven cleaning.

Although the cooker is designed specially for the British market the drop-down door, which is a characteristic of Moffat cookers, has been retained.





Features of the new Moffat cookers: plug-in elements for oven and hot-plate, with flat-pin contacts; and method of placing oven elements

Flat pins are also used for the plug-in hot-plate and grill-boiler. The whole of the hob can be lifted up to enable the plates to be removed without difficulty and obstruction. The round hot-plate—the "Cookquick" type is recommended—is 8 in. in diameter and has a loading of 1,650 W. The grill-boiler measures 7½ in. by 10½ in., and is loaded at 2,000 W.

The overall dimensions of the cooker are 43 in. wide by 17 in. deep by 22½ in. high, and the standard finish is acid-resisting grey and white enamel. Thermostatic oven control is available as an extra. Other features of this cooker, and also of the No. 122 with an oven capacity of 1,700 cu. in., and No. 143 with an oven of 2,635 cu. in., which are shortly to be placed on the market, are the heat-sealing copper gasket which is fitted around the door to ensure a steam-tight fit and the balanced drop-down door which is designed to withstand a very heavy weight. Actually it will bear several stones.

Hotpoint Vacuum Cleaner

The new "500" model Hotpoint vacuum cleaner has an aluminium body, the machine being designed to combine lightness with strength. The B.T.H. motor drives, in addition to the suction fan, a soft bristle brush for beating and sweeping. The spindle is chromium plated.

A rubber-covered reinforced handle grip is fitted and the large capacity dust bag has a gusseted opening to facilitate emptying. The bag clamp is rubber protected and a rubber buffer is also fitted round the base of the cleaner to protect furniture. A foot pedal release locks and unlocks the handle and a thumb screw projecting from the casing permits adjustment to suit the depth of the carpet pile to be carried out rapidly.

Seven yards of non-kinking cable is supplied with the cleaner and a complete set of cleaning attachments as well as a rotary floor polisher are obtainable as extras from the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, London, W.1.

Hotpoint '500' cleaner

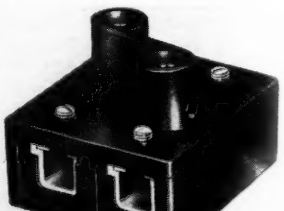
Terminal Blocks

F. W. LECHNER & CO., LTD., 5, Fairfax Road, London, N.W.6., announce the introduction of a British made 12-way terminal block made of bakelite with substantial nickel plated brass terminals and screws. Each unit can be cut into sections and fixing holes are provided between every two terminals. Two sizes are available for 15 and 30 A, the dimensions being 4 7/16 in. by 1 3/16 in. by ¼ in. and 6 1/16 in. by 1 1/16 in. by ⅜ in. respectively.

Service Connector Block

CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, London, E.C.4, has introduced a new universal service connector block, designed to give good electrical performance and high mechanical strength combined with exceptional ease of connection and assembly, for the company's outdoor house distribution and service system.

It is made in two halves, with all metal parts intact, the two halves simultaneously locking when connecting up and thus indicating positive contact. No cutting of the main distributor conductors is entailed, and there is a double contact on each core of the distributor cable. Metal channels facilitate wiring.



The Callender connection block

"Kalanoid" compound is supplied with the block, which can also be used as a terminal block, and it is employed in the "C.B.B." service box.

Only two sizes are required for any arrangement of distributor and service cables: "H.S.T. 1" for twin-core distributor cables 7/.044 in. to 7/.064 in. inclusive, and twin core service cables 3/.036 in. to 7/.064 in. inclusive and "H.S.T. 2" for twin-core distributor cables 19/.044 in. to 19/.064 in. inclusive, and twin-core service cables 3/.036 in. to 7/.064 in. inclusive.

Callender's also announce an improvement in the company's protected earthing lead. The conductor consists of high conductivity tinned copper wires, served with corrosion-resisting compound close spirally armoured with galvanised steel wire, protected by corrosion-resisting compound and reinforced by two strong cotton braids, the inner braid impregnated with a similar compound and the outer braid with fire and moisture-resisting compound.

The lead is not insulated, the outer coverings being for protection against corrosion. The spiral steel wire armour is provided for mechanical protection and is not intended to function as a current-carrying conductor.

Portable Radio Receiver

A new superheterodyne portable receiver, type 228B, has been introduced by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2.

The new model has particularly good quality of reproduction and the control panel has been improved; the rigid carrying handle now sinks flush with the panel, while the recessed thumb-operated controls are neater and more convenient in operation.

VALUATION OF UTILITIES

Recent Judgment with a Wider Bearing

By a Barrister-at-Law

AN important decision was given by the Divisional Court last week in the case of The King v. The Assessment Committee of Thanet and District Assessment Area and the County Valuation Committee for Kent.

The object of this case was to test whether proposals made by the County Valuation Committee of Kent for a revision of the assessments of all public utility undertakings in the county complied with the provisions of the Rating and Valuation Act, 1925.

In March, 1938, the Government introduced the Rating and Valuation (Postponement of Valuations) Bill for the purpose of extending the quinquennial period which normally would have expired in 1939 until 1941. The reason for this extension of the quinquennial period was to enable the Minister of Health to obtain information upon which to form an opinion as to whether the present system of rating was uniformally fair and equitable.

At the same time the Ministry issued a circular letter to rating authorities directing them to prepare provisional lists, and suggesting that such lists could best be prepared by proceeding with the preparations for revaluation which had already been commenced by many local authorities.

At about this time the Kent County Valuation Committee, made proposals for the revision of the assessments of all public utility undertakings in the county.

Definite Information Lacking

The various proposals followed the same form, and stated that the Committee was "aggrieved" by the incorrectness of the valuation list for the area, and that the grounds of the proposal were that the present assessment of the undertaking's hereditaments in the area was "unfair and incorrect." The last column of the schedule to the proposal, under the heading "Amendments proposed," stated "to such an amount as may be determined on the approved apportionment of the cumulo valuation of the undertaking, having regard to the accounts relating thereto for the year ending 31st December, 1937."

The vagueness of the proposals appeared to indicate that the Committee did not possess in respect of many public utility undertakings any definite information upon which to found an opinion as to whether the existing assessments were unfair and incorrect. There is little doubt that it proposed to use the machinery of making a proposal to obtain the information necessary to ascertain whether a prima facie case existed for the revision of any particular assessment in the county.

The public utility undertakers, acting through the medium of the Conjoint Conference of Public Utility Associations, decided to resist the proposals of the Committee, on the ground that they were too vague, and did not give to the occupier any indication of the case which he had to meet. An application was therefore made in November to the Divisional Court for a rule of *certiorari*, calling upon the Committee to show cause why the proposals should not be quashed as failing to comply with the Rating and Valuation Act, 1925.

The Committee's case was heard on April 18th, when it was argued on its behalf that since the proposals followed closely the wording of the Act, they must be regarded as complying sufficiently with the proposals of the Act.

The Court, which consisted of the Lord Chief Justice, and Justices Humphreys and Singleton, unanimously rejected this contention. In his judgment the Lord Chief Justice referred to the provisions of Section 37 (2) (b) of the Act, which provides that every proposal for an amendment of the current valuation list must specify the grounds on which it is supported.

A "Vague" Allegation

He said that the mere allegation that an assessment was incorrect or unfair was in itself vague, and was inadequately explained in the present proposal by a statement of equal vagueness, *i.e.*, that the amendment should be to such an amount as may be determined on the approved apportionment of the cumulo valuation of the undertaking, having regard to the accounts relating thereto for the year ended December 31st, 1937. It was, in his view, at least necessary that the proposals should give some indication as to whether the rating authority proposed to increase or decrease the assessment.

Mr. Justice Singleton, speaking for himself alone, went somewhat further, and expressed the view that since the proposals referred to accounts which were not then in the hands of the County Valuation Committee, it did not appear to him that it could be "aggrieved" within the meaning of the Act.

In its narrower aspect, the effect of the case will be that the proposals made by the County Valuation Committee in 1938 will be quashed. The case has, however, an important bearing on the more general position. It has become increasingly the practice of rating authorities, particularly since the extension of the existing quinquennial period, to endeavour to carry out wholesale revaluations of classes of property, particularly public utility undertakings, within their areas.

Stability of Assessments

The question as to whether such wholesale revaluations are legal is one of considerable difficulty, and the present case does not solve this vital and important question. It would appear, however, that such wholesale revaluations are contrary to the spirit of the Rating and Valuation Act, 1925, which obviously intended that save in unlooked-for and exceptional circumstances, an assessment made at the beginning of a quinquennial period should continue throughout the duration of that period.

A recommendation to this effect has also been made by the Central Valuation Committee, and appeared to be supported by the Minister of Health in introducing the Rating and Valuation (Postponement of Valuations) Bill. It is probable that this question will at some time be directly raised in the Courts, but in the meantime the case under consideration has some bearing on the matter.

It would appear from the judgment, and in particular from a remark interjected by Mr. Justice Humphreys during the argument, that a rating authority cannot be "aggrieved" by the unfairness or incorrectness of an assessment unless and until it has sufficient evidence to establish a prima facie case in support of its contention.

In order to obtain such evidence it would appear to be necessary for a rating authority to serve proper notices under Section 40 of the Rating and Valuation Act, and upon the information obtained to decide whether the making of a proposal for the revision of the current list is justifiable. The mere issue of proposals of the vaguest character upon every hereditament of a certain specified class would appear to be contrary to the requirements of the Rating and Valuation Act, Section 37 (2), in that it would be impossible for such a proposal to specify adequately the grounds on which it is supported.

Impulse Breakers for Littlebrook

ELEVEN 132-kV oil circuit breakers of the impulse-type are under construction for a grid sub-station on the site of the new Littlebrook power station. These are generally similar to the three supplied to the Central Electricity Board for its Lydney 132-kV switching station, which were described and illustrated in our issue of April 21st (pp. 563 and 564).

As in the latter case, the total break time will be only 3½ cycles (the pneumatically operated arc-control device giving a constant effect at all currents) and the use of a single break reduces the weight of moving parts and eliminates electromagnetic throw-off forces as a result of retracting the moving contacts along the current path.

The Littlebrook switches, however, will be rated at 2 million kVA instead of 1½ million kVA as those at Lydney, and in order to give the increased breaking capacity a separate mechanism will be used for each phase but interlocked so as to cause a fault on one phase to trip all three.

Another point in which the two sets of switchgear differ is that the breakers at Littlebrook will be supported on small concrete pedestals and will have separate isolating switches. This is a less expensive method than the one adopted at Lydney, where isolation is carried out by racking the breaker up and down on two supporting pillars. The Lydney design, however, has an advantage where saving in space is necessary, since it enables the "low" type of construction to be used on a site as small as that normally taken by the "high" type.

The main idea behind the development of the impulse breaker has been the demand for faster operating times and higher breaking capacities, particularly the former. An incidental feature is that the new design has a much smaller oil content than previous designs.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

ON April 28th, at the works of British Timken, Ltd., at Aston, Birmingham, the chairman, Mr. M. B. U. Dewar, made a presentation to **Mr. W. Dallow,** director and general manager, on his retirement. The presentation took the form of a 16 mm. talkie outfit, towards the purchase of which all the workpeople, staff, and directors had contributed. Mr. Dallow joined the company on its formation in 1927, when the manufacture of Timken tapered roller bearings was taken over from Wolseley Motors, Ltd., and the plant moved to the present works. Mr. Dallow had been associated since 1916 with the manufacture of Timken tapered roller bearings, having been employed with the Electric & Ordnance Accessories Co., Ltd., and a Director of Wolseley Motors, Ltd., at which Timken bearings had been produced successively between 1916 and 1927. Mr. Dewar paid a high tribute to the work carried out for the company by Mr. Dallow. Mr. B. H. Riley, A.M.I.Mech.E., who fills the position of general manager on Mr. Dallow's retirement, has held successively the positions of assistant works manager and sales manager, engineering division.

Mr. W. Dallow

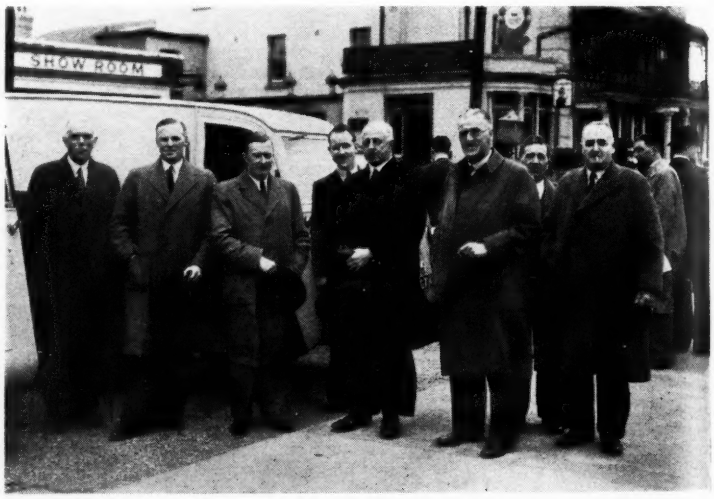
Mr. H. J. Darling, M.I.E.E., chief electrical engineer, East Indian Railway, proceeded on leave prior to retirement with effect from April 13th. **Mr. H. W. Puttick,** M.I.E.E., M.I.Mech.E., has been appointed to the post of chief electrical engineer, East Indian Railway, with effect from the same date.

Halifax Corporation Light Heat & Power Committee has appointed **Mr. T. M. Blackburn,** distribution superintendent, as acting electrical engineer and manager.

Mr. R. E. Atkins, A.M.I.E.E., district engineer to the Norwich Corporation Electricity Department, was married on April 29th, at the Stowmarket Parish Church to Miss Joan Chappell Phillippo, of Stowmarket.

Mr. R. W. Steele. deputy city electrical engineer of Norwich has been elected president of the Norwich Engineering Society.

The annual dinner of the East Kent Branch of the Electrical Contractors' Association was held at Canterbury on April 20th, **Mr. D. McKellar** presiding. Mr. T. C. Gilbert proposed the toast of "The Mayor and Corporation of Canterbury and the Municipalities of East Kent," to which Mr. H. M. Enderby replied. Mr. E. E. Hoadley (Electrical Engineer, Maidstone) proposing the toast of the Association and Branch," referred to the betterment of wiring work and said that contractors should be registered and that no material should be sold unless it had passed an approving house to show that it was safe to use. He did not wish to see apparatus made to a hard and fast specification, but he did think that all apparatus should be made to pass a definite safety test. Other speakers were Messrs. H. M. Drake (past-president of the Association), H. T. Laslett, M. R. Neville and H. J. Hines (Principal of the Canterbury Technical Institute).



A group at the recent electric vehicle demonstration at Wanstead, reported in our last issue. The group includes Mr. A. C. Cramb, Major A. L. Trundle, Messrs. J. W. Townley, A. W. Barham and Robertson

Despite adverse weather conditions there was a record attendance at the Annual Concert of the Dagenham Cables Sports Club, at the East Ham Town Hall, on 29th April, over 1,000 members and friends attending at the invitation of the president, **Mr. J. Snow Huddleston,** managing director of the Union Cable Co., Ltd., and Southern United Telephone Cables, Ltd. The programme was presented by Murray Ashford's Concert Party, supported by Tommy Fowler's Band with Sheila Glick, a crooner who is a prominent member of the club. A vote of thanks to the president was proposed at the end of the performance by Mr. T. Kyne and Mr. Huddleston replied. A collection during the evening realised the sum of £10 for the King George Hospital, Ilford.

At the Batti-Wallahs' Society luncheon on April 26th **Mr. J. McCaffery, O.B.E.,** occupied the chair for the first time as the new president of the Society. The principal guest was the Marquess of Tavistock, the subject of whose address was "Poverty and Over-taxation." Following a commentary on banking systems, loan procedure and means of "creating new money," all of which he considered to be not conducive to the creation of a satisfactory economic system, the Marquess gave various reasons why he regarded existing financial methods as incapable of "delivering the goods," either literally or metaphorically. He spoke next of the "perfectly ridiculous" method of supporting the unemployed and the "equally ridiculous" way in which the State obtained its revenue: burdensome and cumbersome methods of collecting money from one section of the community merely to hand it back to another section, so that both were kept short of their needs.

The next luncheon will take place on May 25th when Mr. L. J. Comrie, M.A., Ph.D., who was for many years in charge of the Nautical Almanac at the Admiralty, will speak on "Calculating Systems and Machines."

Mr. A. A. Jackson, M.Inst.T., F.R.S.A., manager and engineer to St. Helens Corporation Transport Department has been selected by the Bolton Corporation Transport Committee to succeed the late Mr. J. Barnard as manager and engineer of Bolton Transport Department at a salary of £1,200 a year. Mr. Jackson has been connected with road transport since he entered Nottingham Corporation Transport Department as a junior assistant. In fourteen years he became successively technical assistant and chief assistant, and had experience in administration, accountancy, traffic and engineering. Afterwards he was deputy engineer to Coventry Corporation. While he has been at St. Helens the Department has grown rapidly. The fleet of vehicles consists of 55 trolley buses and 38 motor buses. **Mr. A. Entwistle,** the Bolton chief traffic assistant, has been appointed deputy general manager, at a salary of £600 a year. He has been with the Department for twenty-five years.

Mr. T. E. Morgan, manager in Victoria for the British General Electric Co., Ltd., accompanied by Mrs. Morgan, left Australia recently for a combined holiday and business tour of England and the Continent.

On April 20th, in the works canteen, Dagenham Cables Dramatic Club presented for the first time a full evening's entertainment for the members of the club, their choice being the farce, "The Three Half-crowns," by John Melluish. The attendance was excellent, and the players had every support from the appreciative audience. There were plenty of laughs in the bill of fare, and they were served up with efficiency and dispatch which would have done credit to a much more experienced team. All the players gave their parts an intelligent interpretation, and a strong feature was the fact that the minor parts were as carefully and successfully done as the others. The play was performed in curtains, and much ingenuity was shown in the insertion of windows and doors which, combined with adequate lighting, provided an excellent setting, and one which contributed much to the retention of dramatic illusion throughout the show. At the conclusion of the performance, Mr. J. Snow Huddleston, managing director of the company, offered his congratulations to the players and Miss H. M. Cowley, welfare superintendent, who produced the show. Mrs. Huddleston presented a bouquet of carnations to Miss Cowley from the members of the cast.

Mr. C. B. Kingsford has been appointed manager of the Switchgear Sales Department, Willesden, of the British Thomson-Houston Co., Ltd. **Mr. L. Drucquer,** of the same department, has been appointed assistant manager.

Mr. S. C. Gibson, electrical engineer and manager of the Nuneaton Corporation Electricity Department, who was due to retire shortly, has, at the request of the Corporation, decided to continue in his present position for a further year. He will not, therefore, be retiring under present arrangements until the end of May, 1940.

Mr. S. H. Hart, A.M.I.E.E., has recently resigned from the position of outside contracts engineer with Siemens Bros. to rejoin Highfield & Roger Smith, consulting engineers. During the past four years he has been engaged on laying telephone and power cable in all parts of the country. Previous to this he was for two years in the Birmingham office of Highfield & Roger Smith.

Mr. H. Towers has been appointed acting general manager of Edmundsons Electricity Corporation, Ltd.

At a meeting of the board of the Shropshire, Worcestershire and Staffordshire Electric Power Co. on April 24th **Mr. D. H. Kendon** was appointed general manager of the company as from May 1st. **Mr. E. Morgan** has resigned as managing director of the company as from May 1st.

Mr. Bernard Smith was married at Christ Church, Sutton, on April 21st to Miss Sybil Brown, of Leeds. Mr. Smith is the youngest son of Mr. Lewis Smith, general manager of Smith Meters, Ltd., and is assistant sales manager in the electrical department of the firm.

Mr. A. G. Connell, chief electrical engineer to the Staveley Coal and Iron Co., has been elected president of the Midland Branch of the Association of Mining Electrical Engineers. He was recently appointed a member of the Government Commission to report on the use of electricity in mines.

Mr. J. F. T. Armsby, formerly on the staff of the Leicestershire and Warwickshire Electric Power Company at Hinckley, Leics, and now the company's development representative at Rugby, was married recently at Hinckley to Miss Mary Higginson.

Mr. W. G. Watson, managing director of W. G. Watson & Co., Ltd., electrical engineers, of 279, Clarence Street, Sydney, N.S.W., is now in London on a business visit to this country. British electrical firms anxious to develop business in Australia are requested to get into touch with Mr. Watson, c/o Sanderson, Murray & Elder, Ltd., 47, Gresham Street, E.C.2.

OBITUARY

Dr. C. F. Hirshfeld, chief of research of the Detroit Edison Co., died at Grace Hospital on April 19th, after an illness of several months. He was distinguished in numerous fields, his work including consulting practice in several branches of engineering, many noted research activities, and war service in 1918-19 with the rank of lt.-colonel in the U.S. Ordnance Department. He was the author of many books and papers on engineering subjects, and in recent years was concerned in the development of the P.C.C. street car, a revolutionary advance in the field of urban transport.

Col. J. S. Ruston.—We regret to record the death of Colonel J. S. Ruston, chairman of Ruston & Hornsby, Ltd., which occurred on April 28th, at his London home. Col. Ruston had been associated with the company all his business life and had been chairman since 1901.

Mr. Cyril Hazelhurst, assistant mains engineer at Ashton Corporation electricity works, died last week. He had been previously inspector in the consumers' department and on the power station switchboards. Before starting at the electricity works, he was employed by a Manchester electrical firm.

Mr. H. Croft.—The death has occurred of Mr. Herbert Croft, who spent many years travelling on behalf of Crofts (Engineers), Ltd. Mr. Croft, who was seventy-five, was a brother of the founder of Crofts (Engineers), Ltd., and he had been engaged in the service of the company practically all his working life. For the past 16 to 18 years he had been manager of the company's London office, and he maintained his active interest until his death. He leaves a widow.

OVERSEAS REPRESENTATIVES

Some of the Desirable Qualifications

FILLING from the home organisation a post in the overseas branch has always called for the nicest discrimination on the part of executives, but, to-day, responsibility for adequate selection is far greater than it was even a decade or so ago. Apart from the fact that competition in goods is keener, foreign manufacturers are ensuring that their manpower abroad is the most expert available, so that constant vigilance is required of British firms in order to maintain the high standard of their overseas personnel.

While it is not possible to measure human ability by a foot rule, there are certain basic qualifications which are essential to every post, and in overseas appointments they have wider ramifications and are more elastic in interpretation than in home business. Broadmindedness, for instance, is indispensable to one who is to be his company's ambassador abroad.

Opinions as to the salient qualifications required in an overseas representative differ widely, but in one respect at least there is no divergence of view, namely, that the main essentials are those that home trade demands—selling ability and a thorough knowledge of the goods to be sold. These are, in fact, obvious, but they have additional importance in export because the clientele of an overseas branch is scattered and calls upon customers are less frequent than in England.

Knowledge and Initiative

Consequently, it is incumbent upon a representative to make his selling points and create a good impression in a shorter space of time. Similarly, he should be able to answer promptly the technical questions which may be put to him, and, further, he should have sufficient shipping knowledge to give approximate, if not exact, estimates of landed prices. There is no chance of approaching the head office or factory, cablegrams are expensive and, moreover, the customer will expect a reply on the spot and will be far from impressed if he does not get it.

Selling ability is not difficult to recognise. It is the additional qualifications distinguishing an overseas representative from the man at home which provide the problem. For instance, should he know a foreign language? This question will be debated as long as differences of tongue exist. Many firms have always insisted that their overseas employees shall be conversant with one foreign language, perhaps two. Some require only a smattering. Others, again, place no importance on the qualification. Most, however, can point to evidence showing that their policy has been successful.

It would not be dogmatic to assert that thorough knowledge of a language is not necessary, and that complete ignorance is to be avoided. The happy medium is the object to attain, for the vocabulary of buying and selling is not extensive and is comparatively simple to acquire. Moreover, the executives of most foreign firms handling technical goods regularly receive correspondence in English and therefore will certainly be able to make themselves understood in that tongue. If it is possible to obtain a man speaking several languages and possessing the quality of salesmanship as well, he is an obvious choice, but owing to the degree of specialisation demanded by both subjects, such an individual is not easily found.

More essential than linguistic ability is a sound background of the history and economic and social conditions of the country of domicile; in fact, this is often advanced in support of the argument urging fluency in a language, from which, it cannot be denied, such a background can be most readily acquired. The importance of the social side of commerce needs no stressing, and it behoves a representative in the Far East, for instance, to accommodate himself to the seemingly interminable courtesies which precede an interview, and one in Scandinavia to refrain from comment on the neutrality policy of the Baltic States. British insularity is sometimes inclined to regard such points as these as trifling, but, abroad, they become part and parcel of commercial diplomacy.

The man who displays sympathetic interest in foreign affairs is always worthy of consideration, as self-imposed training of this kind tends to produce a personality which will conform naturally to foreign customs and mannerisms. Much of the success of overseas selling depends on the impression created by the resident representative and his capacity to make and maintain cordial relations with the influential men in his line of business. His knowledge and personality should be such that a great deal more can be left to his judgment than is normally entrusted to the home sales force.

An American business leader once declared that an overseas representative needed only one qualification, namely, that he should be a "real gentleman." Although perhaps few will disagree with the definition, it has to be remembered that the conception of the word "gentleman" varies with almost every degree of latitude and longitude. Selling ability, knowledge, experience, personality and powers of observation are essential, but adaptability to a particular country and its people is probably the deciding factor.

COMMERCIAL AND INDUSTRIAL NEWS

Swedish Trade Delegation. A New Collier for Fulham. British Exhibits at the World's Fair. Building Centre Exhibition. Electrical Equipment at Tottenham Polytechnic

Electric Vehicle Exhibition at Gateshead

THE Northern Counties Area Electric Vehicle Committee has arranged an electric vehicle exhibition to be held at the Team Valley Trading Estate, Gateshead, on May 10th and 11th. An inaugural luncheon will be held on May 10th at which Sir John Maxwell (Northern Traffic Commissioner) will preside and short addresses will be given by Mr. F. C. Pette, of Middlesbrough, and Mr. A. E. Bailey, of Newcastle-upon-Tyne.

F.B.I. at Paris Fair

The Federation of British Industries will be represented at the Paris Fair which opens on May 13th by a new stand decorated in red and white and occupying a prominent site at the main entrance. Visitors to the Fair will find at the stand full information relating to British goods, and overseas buyers who wish to be put in touch with British manufacturers will be given every assistance. Arrangements have been made by which, upon payment of a small fee, members of the F.B.I. can display their catalogues at this stand, where advice on such points as the interpreter service and the location of various classes of exhibits will be given. At the week-end, from May 26th to May 29th, a special visit will be paid to the Fair by members of the Association of British Chambers of Commerce and the Federation of British Industries. The party will travel at reduced rates, and will be entertained during the week-end by the Paris Fair Committee.

Swedish Trade Delegation

As a result of the recent visit to Sweden of Mr. R. S. Hudson, M.P., Minister of Overseas Trade, it has been arranged that a delegation from Sweden shall proceed to England in the course of the next few weeks, under the auspices of the Swedish Federation of Industries and Export Association, to discuss the question of furthering trade between the two countries. The Federation of British Industries has accepted the responsibility of organising the meeting of industrial groups in Great Britain which desire to discuss with the Swedish delegates the possibility of increasing exports from this country to Sweden. The Swedish and British Federations of Industries are already in touch, and it is proposed that early next month Mr. C. F. I. Ramsden, Foreign Director of the F.B.I., should visit Sweden to make the necessary preliminary arrangements for the meetings in England.

Engineering Exports Survey

It is a tribute to British manufacturers that by the employment of the more orthodox methods of trading they have in many important categories not only maintained but increased their exports in the face of State-aided competition. Many of our leading industrialists, looking beyond the present time of high-pressure production for Governmental need, are anxiously surveying possibilities of export expansion. Valuable guidance in this direction is provided in practical form by a detailed survey of engineering exports for 1938 classified under 102 headings and covering 111 markets, just issued by the *British Engineers' Export Journal* in collaboration with H.M. Customs and Excise. The survey is obtainable from the publishing office, Dorset House, Stamford Street, S.E.1, price 10s. 6d.

Hammersmith "Chief's" Salary

In March the Hammersmith Borough Council advertised for a chief electrical engineer at a salary of £1,200, rising by annual increments of £50 to £1,400. The Associated Municipal Electrical Engineers and the Electrical Power Engineers' Association thereupon "banned" the position, maintaining that a minimum commencing salary of £1,400 should have been offered. The Borough Council, after reconsidering the matter, has now put out a new advertisement offering a commencing salary of £1,400, "rising during the next three years' service to the appropriate minimum of the scale of salaries for chief electrical engineers for the time being in force and approved by a properly constituted national authority." This has received the approval of the two engineers' associations. It will be remembered that the setting up of a "properly constituted national authority" and district committees is now proceeding.

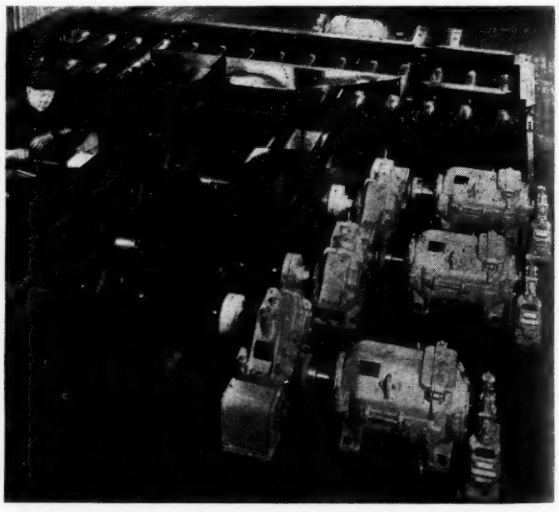
Fulham's Colliers

For conveying coal to its power station from Scotland, the North-East Coast and Wales, Fulham Electricity Department employs four colliers. The latest to go into commission was *Fulham IV*, and in the summer *Fulham V*, to be launched next month, will be added to the fleet. The five boats were built by the Burntisland Shipbuilding Co., Ltd. *Fulham IV* has self-trimming holds and the propelling machinery is of modern triple expansion type manufactured by the North Eastern Marine Engineering Co. (1938), Ltd., *Fulham IV* and *Fulham V* each has a 15-kW generator and the engines are of the enclosed forced lubrication type, supplied complete by the Sunderland Forge and Engineering Co., Ltd. The electrical apparatus in the saloon galley includes a "Frigidaire" refrigerator, "Heatrae" water heater, and Carron electric cooker. In the officers' saloon amidships is a radio telephone for use in communicating between ship and shore, and the bridge and engine room are connected with loudspeaking telephones to facilitate management of the vessels. An air conditioning system is installed in the seamen's quarters aft, and the wiring of the vessels is arranged so that, on arrival at the power station, shore connections can be made and the electrical auxiliaries operated from the mains supply. Approximately 1,400 yd. of Henley cable of various types has been used for the wiring of each collier.

The "Fulham IV" collier

The World's Fair

We have heard from two other British manufacturers who have contributed to the arrangements at the World's Fair, New York, which opened on April 30th. In the British Pavilion films are being shown portraying conditions and life in England and representative of various industries and institutions of this country. The films will be on both the standard cinema size and also the sub-standard 16 mm. size, with and without accompanying sound. To shows these films, projection apparatus was required which was in itself a completely British product and incorporated all the latest improvements and refinements known to the industry. The Department of Overseas Trade, which was responsible for the British Pavilion, decided to use sound and picture projection apparatus manufactured by the British Thomson-Houston Co., Ltd. The equipment comprises Type "R" twin stand 35-W sound repro-



Westinghouse model rolling mill at the World's Fair

ducer with rotary magnetic soundheads; projector mechanisms with fireproof spoolboxes; and 50-A high-intensity arc lamps using "Morganite" carbons, together with associated apparatus, including hot-cathode arc rectifiers, control panels, &c.

One of the most interesting exhibits is the scale model of Victoria Falls, which is being shown by the Rhodesian Government. Most realistic effects are by simulating the varying moods of day and night. The work of producing and installing the lighting for this model was entrusted to the Strand Electric and Engineering Co., Ltd., against keen competition from American concerns. In housing this exhibit provision had to be made for the special effects equipment and the building was designed by Mr. Norman Yule and Mr. L. E. W. Stokes-Roberts. The model is 160 ft. long by 20 ft. high with all the geographical and vegetation features faithfully produced to scale. Water at the rate of 60,000 gallons per minute flows over the Falls, creating in miniature the roar of the orginal. The cycle of day-and-night effects is produced by banks of lanterns with three-colour mediums, incorporating various mechanical effects, controlled by a battery of special automatic dimmers, which are fitted with the company's patent magnetic clutch. Commencing with a misty dawn, the light gradually increases in intensity until the brightness of midday is reached, passing on to the afternoon and early evening, when the light becomes more dim. During this period there is an effective reproduction of a rainbow which is reflected in the water, and as this fades away with a dying sun at one end of the model a sombre night effect covers the whole scene with a deep blue sky with twinkling stars. The whole sequence occupies only 3½ minutes. Mr. Stokes-Roberts, who is responsible for the design of the lighting, recently sailed for America to supervise the installation of the model and equipment.

We reproduce on the preceding page a novel exhibit at the Fair—a miniature steel mill, 25 ft. long, shown by the Westinghouse Co. Visitors will be able to switch on the plant and "roll" 6-ft. cold steel billets through the mill.

New E.C.A. Members

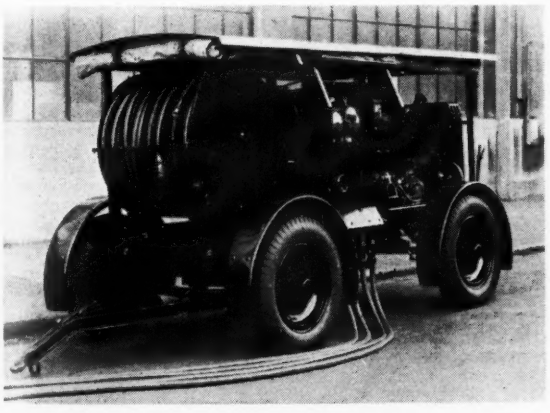
At a recent meeting of the E.C.A. Council the following contractors were admitted to full membership:—

Beaumont & Whitley, H. Birkhead, Blagborough & Hebblethwaite, F. C. Edgar, Gath Electrical Engineering Co., Ltd., Grangers, James Haley & Co., Ltd., Hamar & Co., Ltd., Headen & Brennard, R. Maude, Ltd., J. R. Musgrave, Thomas and Ackroyd, and Town & Ramsden, all of Halifax; W. Gregory & Son, Ltd., Lincoln; R. Kirkland, Blyth, Northumberland; C. F. Sibley, Oxford; and Callas, Son & May, Ltd., Reading.

Mobile Battery Chargers

Normally G.P.O. telephone-exchange batteries are kept fully charged from the AC mains. Should the public supply fail, an exchange can continue its normal service for a time from its batteries. In thickly populated areas only a few hours' interruption of the mains supply might discharge the batteries, especially as supply failures result in greater use of the telephone. Mobile charging-sets are, therefore, kept at selected centres and towed to areas in which the supply seems unlikely to be restored for a certain length of time, by means of a Post Office standard 3-ton lorry.

A number of such sets have been designed by Tilling-Stevens, Ltd., to the general requirements of the G.P.O. Engineering Department. The four-cylinder petrol engine (102 mm. by 140 mm.) is the same as that used for the Vulcan 5-ton chassis and for the company's War Office searchlight chassis, and is flexibly mounted at three points. The ignition is by magneto, and the Solex carburettor is of the governor type allowing a maximum engine speed of 1,300 RPM. A short shaft with rubber-type universal joint connects the flywheel to the armature shaft of a four-pole shunt wound 30 kW DC generator (370 A at 81 V and up to 525 A at 57-22 V at 1,240-1,260 RPM).

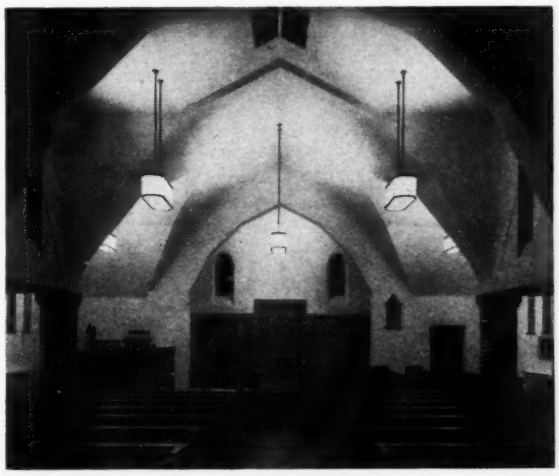


Tilling-Stevens mobile battery-charging set

As the charging sets may stand idle for long periods a Williams & James compressed-air engine starter has been installed instead of a battery starter. With air at 350 lb. per sq. in., opening the starting valve for 1½ to 2 sec. will turn the engine rapidly through two revolutions. Up to forty separate starts may be made before the pressure in the air bottle falls to its low effective limit of 150 lb. per sq in. The switchboard carries a circuit-breaker with overload release, reverse-current cut-out, shunt-field regulator, ammeter, voltmeter and lamp switches. The lamp is supplied through a barretter and resistance to allow for the wide voltage range. Mounted above the generator are two petrol tanks to hold 60 gal. in all—sufficient for sixteen hours' continuous running at full load. The front end of the chassis carries a sheet metal drum in eight sections in each of which is wound a 60-ft. length of flexible rubber-covered cable with plug and socket fittings. The whole unit weighs under three tons, including half a ton of cable.

Church Lighting Installation

For the lighting of the new Methodist Church at East Grinstead a special design of Holophane fitting for semi-direct lighting is used. The units were made in collaboration with the architects who required a modern style which would give an excellent shadowless lighting effect. The church has a short transept in which three of the fittings are used, one in the centre, and one at each side. The nave is lighted by four similar fittings. Three 100-W intensive type "Stiletto" reflectors are used in each fitting, the sides and bottom of which are glazed with Montene glass, and the rounded panels at each end are of white flashed opal. The use of Holophane reflectors for indirect lighting has enabled the panels of the fittings to be illuminated by transmitted light, while still maintaining the high intensity lighting effect on the ceiling. The success of this installation has been such that other churches have been planned upon similar lines.



Holophane semi-indirect lighting fittings at East Grinstead Methodist Church

Swiss National Exhibition

To-morrow (Saturday) the first post-war Swiss National Exhibition opens at Zurich and will continue until October 29th The display has an excellent setting on opposite shores of Lake Zurich flanking the city which is situated at the end of the lake. It is designed to show every phase of national life and, naturally, as electricity plays so large a part in the Swiss economy, it is well represented. About 99 per cent. of the electricity used in Switzerland is generated by water power. The Electrical Section of the exhibition includes a working model of a hydro-electric development, covering an area of 150 ft. by 75 ft. and comprising two rapid streams, a storage lake, the power house and sub-station. There are also transmission and distribution exhibits as well as examples of electrical applications. A separate section covers low-current matters, including radio and television apparatus, and there is a high-voltage laboratory. Plant in the Electricity Pavilion furnishes electricity to the whole of the exhibition.

Special exhibits include a cross section of a large Francis turbine for the Nile power station, a 140-ton generating set for La Dixence (Valois), a new gas turbine, 150,000-V cables and a new 1,200-HP electric locomotive designed for the St. Gothard line and capable of attaining a speed of 110 km. per hour.

High-voltage DC transmission is represented by a 50-kV line from the Limmat (Wettingen) power station to the exhibition.

Special travelling facilities are available to British visitors.

Building Centre Exhibition

On Tuesday last a Novelty Exhibition was opened at the Building Centre, 158, New Bond Street, W.1; it remains open until May 20th. While the majority of the exhibits are of building and decorating materials, electrical equipment finds a place. One of the most noteworthy items is a kitchen unit shown by the Hotpoint Electric Appliance Co., Ltd., comprising a washing-up machine, draining board and sink, a "Disposall" unit for grinding up bones and other waste

matter, and a clothes washing machine neatly housed beneath the draining board.

Among the cooking equipment shown is a "Backer-Jackson" portable boiling unit (Jackson Electric Stove Co., Ltd.) and a "Crypto Rotopan" low-pressure steam cooker comprising a "pagoda" of saucepans (Lancashire Dynamo & Crypto, Ltd.). The heating apparatus on view includes a typical "Thermovent" convector (E. K. Cole, Ltd.); a "Sunrise" imitation-coal fire (Bratt, Colbran & Co., Ltd.); and a warming horse—a small convector unit provided with a detachable clothes-drying frame (Unity Heating, Ltd.).

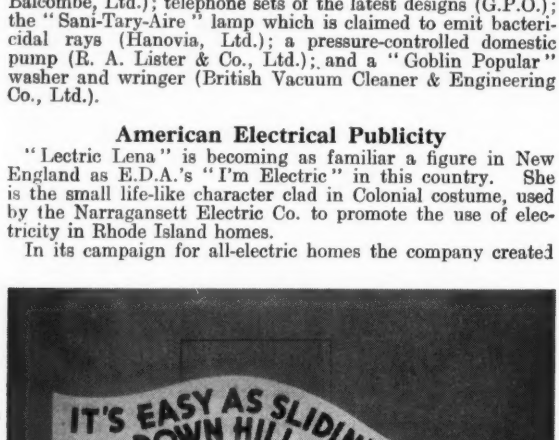
Lighting equipment is prominent, the following concerns having contributed various items:—Amplilux Lighting & Illumination Co., Ltd. (prismatic rings and bells); Best & Lloyd, Ltd. (standards and shades made up with hessian and string) British Aluminium Co., Ltd. (special-process aluminium pendants); Claude-General Neon Lights, Ltd. (hot-cathode and ripple tubing); General Electric Co., Ltd. (combined mercury and tungsten lighting and colour-matching unit); Linolite, Ltd. (picture lighting and moulded fittings); Frederick Thomas & Co., Ltd. (screwless wall fittings and ceiling fittings); and Venner Time Switches, Ltd. (light-sensitive switch for street lamps and an A.R.P. warning switch).

Other exhibits are a defrosting clock for refrigerators (A. J. Balcombe, Ltd.); telephone sets of the latest designs (G.P.O.); the "Sani-Tary-Aire" lamp which is claimed to emit bactericidal rays (Hanovia, Ltd.); a pressure-controlled domestic pump (R. A. Lister & Co., Ltd.); and a "Goblin Popular" washer and wringer (British Vacuum Cleaner & Engineering Co., Ltd.).

American Electrical Publicity

"Lectric Lena" is becoming as familiar a figure in New England as E.D.A.'s "I'm Electric" in this country. She is the small life-like character clad in Colonial costume, used by the Narragansett Electric Co. to promote the use of electricity in Rhode Island homes.

In its campaign for all-electric homes the company created



"Lectric Lena" in a window display by the Narragansett Electric Co.

the character as a symbol of its products—cookers, refrigerators, house cleaners, dish washers, washing machines, ironers and all the smaller electrical apparatus. She first made an appearance through newspaper advertising, which has continued to be the principal medium by which her activities are announced. Her first advertisements appeared under the heading "Situation Wanted—Female." They bore no advertiser's signature and listed Lena as desirous of obtaining general housework. Later advertisements showed her receiving offers of a job from hundreds of housewives who sought a perfect servant for their general maid. Poster and radio advertising has also brought forth favourable comment. One display of special interest showed "Lena" in a large movable rocking chair, rocking to and fro. Calendars reproducing this in miniature were circulated early in the year.

With the established popularity of this figure, the company further enlarged its programme by naming "Lectric Lena" as hostess of the electric shop where all its products are on display; she is portrayed by Miss Mary Lou Gourlie, home light adviser.

Japanese Radio and Television Industry

According to the *Far Eastern Review*, imported apparatus is now little used in radio telegraph communications in Japan. Local makers supply not only the special designs for Government use, but also all kinds of transmission and receiving instruments for long or short wavelengths and accessories for ships, aeroplanes, international communications, &c. Radio broadcasting equipments were only imported for the first station which was put into service in 1924, all other stations being equipped with Japanese apparatus throughout. Television is being studied by the Electro-Technical Laboratory of the Japanese Ministry of Communications, Waseda University, the Hamamatsu Higher Technical School, the Japan Broadcasting Association and the Tokyo Electric Co. They have already experimentally transmitted and received images, and television broadcasting is scheduled to be inaugurated in the country soon.

Fire-refined Copper

Before 1933 electrolytic copper alone was regarded generally as suitable for electrical purposes. At the beginning of that year, however, fire-refined wire bars were produced by British Copper Refineries, Ltd., at a new refinery at Prescot, all claimed to be superior in some respects to those derived from the electrolytic process, which incidentally calls for fire-refining as well.

The ore comes from the Roan Antelope Mine in Rhodesia and is now the source of all copper used by British Insulated Cables, Ltd., who state that the greater consistency in conductivity due to the small difference in maximum and minimum values has obviated the need, previously experienced with varying brands of electrolytic copper, of adjusting their manufacturing processes to suit different consignments.

B.S.S. No. 198-1925 for electrolytic wire bars calls for a minimum conductivity of 100 per cent. as against the United States requirement of 99.3 per cent. Comparative tests during a period of five years have shown maximum and minimum conductivities for B.C.R. copper of 101.49 and 100.11 per cent. of the I.C.E. standard with an average of 100.8 per cent., whereas corresponding figures for electrolytic copper were 102.68 and 98.72 per cent., the average being 100.6 per cent.

Fire-refined copper can be drawn, rolled, spun or riveted and is said to be more resistant to fatigue than electrolytic copper. Of the 250,000 tons of high-conductivity copper produced at Prescot up to the end of last year, 6,000 tons have been supplied to B.S.S. 174 for overhead telephone or telephone wires, which is regarded as the most stringent of its kind that there is. It has also been supplied in the form of extruded rods and sections and rolled sheets.

Turkish Radio Imports

The Government of Turkey has decided to import duty free 10,000 low-price radio sets capable of receiving the Ankara broadcast transmissions. These sets will be disposed of at low prices to the rural population and no listening licence will be required for them.

Works Visits

The International Foundry Congress this year is being held in Great Britain, and business meetings and works visits are being arranged in London from June 12th to June 17th. Afterwards a "post-congress tour" is being held, with visits to the Midlands and other centres of the foundry industry. During the stay in Birmingham the foundries of the Midland Electric Manufacturing Co., Ltd., W. and T. Avery, Ltd. and the Austin Motor Co., Ltd., are to be inspected.

Electro-Horticultural Equipment

Electrocult, Ltd., Station Road, Harpenden, Herts, informs us that it has acquired the works and the business previously carried on by the Electro-Horticultural Equipment Co., Ltd. (now in voluntary liquidation), as manufacturers of electric soil sterilisers, thermostats, heating equipment for greenhouses and other electrical apparatus for horticultural purposes. The directors of the company, which was registered on March 18th, are Messrs. A. A. N. Buchanan (chairman), P. Rosling, N. Taylor, and J. W. W. L. Pendleton (manager).

In this issue we record the registration of Allan Monkhouse, Ltd. Mr. Allan Monkhouse, who was managing director of the Electro-Horticultural Equipment Co., informs us that the new company is to manufacture and distribute a range of soil sterilisers on standardised lines.

Tottenham Polytechnic Extensions

Considerable additions to the electrical installation as well as the provision of much new electrical plant and equipment have been necessitated by the enlargement of the Tottenham Polytechnic, which is nearing completion. The 415-240-V supply from the Northmet Co. is handled by a new main switchboard comprising English Electric metal-clad gear with h.r.c. fuses and G.E.C. sub-switches and sectionalised for lighting, heating and power. "Kartret" fuseboards, generally recessed units with teak cases, are used for local positions.

The main distribution throughout the building is carried out by means of paper-insulated cables, single wire armoured and served, run in easily accessible ducts under the corridors. Glover's cables are employed throughout and the electrical contractors, Davis Myer and Co., Ltd., have taken special care to make the layout of the conduit work (Walsall) pleasing to the eye. Altogether there are about a thousand lighting outlet points, as well as some fifty clock points. M.K. switch-plugs and Crabtree wall switches have been adopted throughout and the lighting fittings have been supplied mainly by Benjamin Electric, Ltd., Frederick Thomas & Co., Ltd., and Restlight, Ltd. Outside the building a number of Ascog units are to be seen. There is a 15-line Phœnix internal telephone installation and a Julius Sax bell system.

Most of the new electrical machinery is to be found in the woodworking shops where Sagar and Wadkin plant includes circular and hack saws and mortising, sanding, planing and dovetailing machines. To control these a special iron-clad

switchboard has been provided, an E.A.C. contactor controlled from several positions immediately cutting off all supplies in an emergency. Brookhirst and A.E.M. starters are generally fitted on individual machines.

In the forge an "Alcosa" blower (Wm. Allday) driven by a 1/6-HP 2,800-RPM motor has been installed, while the welding shop is equipped with a self-contained single-operator DC plant (J. H. Holmes & Co.) as well as three AC units (Murex). The latter are fed from a three-phase transformer, each of the three booths being connected to a separate phase. A "Safette" control panel (L. Weekes (Luton), Ltd.) is used in conjunction with Murex chokes, a copper strip acting as earth return to each booth.

A Hewittic mercury-arc rectifier and two Macfarlane motor-generators are just about to be installed to cater for the requirements of the electrical installation shop, which is being re-equipped, and also the physics laboratory, where terminal blocks are to be provided at the ends of the benches to give low-voltage DC. Classrooms are provided with conveniently placed power points for demonstrations, and special lighting arrangements are made in the art room and the photographic section. Enlargement of the assembly hall has included the provision of an entirely new stage equipped with nine proscenium lights and eighteen footlights, the latter being constructed in a wooden housing and arranged to permit swivelling. Facilities are provided for the use of dimmers and for blacking out the auditorium lighting from the stage.

A.R.P. in Factories

The Provisional Code of instructions for the provision of air-raid shelters for persons working in factories and commercial buildings is now available from the Stationery Office (price 6d.). The protection of plant and equipment is outside the scope of the Code which lays down the requirements for the safeguarding of personnel and the means of carrying them out. Both exterior and interior shelters are dealt with and details and drawings of methods to be adopted in typical buildings are given.

Prices of Materials

Henry Gardner & Co., Ltd., report, May 3rd: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 10s., 5s. increase. Spelter, £13 7s. 6d., 3s. 9d. decrease. English block tin, £225, £2 increase. Mercury, no change.

Frederick Smith and Co. report, May 3rd: Electrolytic copper bars, £49, 15s. increase. Ditto, ditto, wire rods, £53 15s., 15s. increase. Ditto, ditto, h.c. wire, 7¾d., 1/8d. increase. Silicium bronze wire, 8¾d., 1/8d. increase.

Edward Till and Co. report, May 3rd: India rubber, Para fine, no change.

Kettering Electricity Conference

A luncheon and meetings of the District Joint Council and the District Joint Board No. 7 Electricity Supply Industry, were held at Kettering on April 27th, the Mayors of Kettering, Loughborough, Mansfield and Burton-on-Trent attending the luncheon. The Joint Council comprises representatives of the employers and workmen and the Joint Board representatives of the employers and technical staffs. Ald. A. Sturgess, O.B.E., Derby, proposed "The Mayor and Corporation of Kettering" and made congratulatory references to Kettering's elevation to Borough status. Mr. W. H. Gilkes, chairman of the District Joint Council, spoke appreciatively of the value of Whiteleyism, which had been in existence for twenty years and was of extreme benefit to those engaged in the production of electricity over the area covered by the Council. The Whitley spirit was to ensure fair dealing for everyone engaged in the industry.

Trade Announcements

We are informed that the Mitchell Electric Co., Ltd., a notice relating to which appeared under "Company Liquidations" in our issue of April 14th, has now made arrangements to carry on, and for the time being it will be trading as the Mitchell Electric Co. The company is in a position to give deliveries of all its lines, including the "Wizard" electric iron, "Mitchell Crescent" and "Supremus" electric portable and inset fires.

Bill Switchgear, Ltd., has appointed the following representatives for its switch and distribution gear:—Yorkshire Area: Mr. W. Hambly, 6, Park Place, Leeds. Bristol and South Coast Area: Mr. A. M. Everett, 17, London Road, Southampton. South Wales Area: Mr. F. W. Jeenes, 26, Ninian Road, Roath Park, Cardiff.

New Catalogues and Lists

Electromagnets, Ltd., 48, High Street, Erdington, Birmingham, 23.—A folder illustrating permanent-magnet equipments.

Marelli & Co., Ltd., Artillery House, Artillery Row, Victoria Street, London, S.W.1.—Leaflet E/499 relating to exhaust fans from 18 in. upwards for AC and DC.

Kestner Evaporator & Engineering Co., Ltd., 5, Grosvenor Gardens, London, S.W.1.—Leaflet No. 267 dealing with "KD" patent desiccators.

Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.—Folder No. 67, dealing with electrically operated automatic furnace regulators.

J. Gerber & Co., Ltd., Heather Park Drive, North Circular Road, Wembley.—A stock list of second-hand electrical equipment and power plant.

Blackstone & Co., Ltd., Stamford.—Folders Nos. 901 and 902BB, describing Blackstone-Brush Diesel engines.

British Thermostat Co., Ltd., Sunbury-on-Thames.—Details of excess temperature cut-outs and alarms.

Tudor Accumulator Co., Ltd., 50, Grosvenor Gardens, London, S.W.1.—A folder incorporating four publications on: "Safetylyte Emergency Lighting," "Floating Battery System of Emergency Lighting," "Tudor Safetylyte B" and "Safetylyte System Minor Equipments."

Kirkstall Forge, Ltd., Leeds, 5.—A 122-page art catalogue dealing with bar products of the company's rolling mills, cold drawing and bright bar departments.

Visco Engineering Co., Ltd., Stafford Road, Croydon.—A catalogue describing unit dust collectors for grinding machines, &c.

W. C. Davey & Co., 176, Tottenham Court Road, London, W.1. A leaflet relating to "Sterdy" luminous indicators.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 44-page catalogue illustrating and describing industrial motor control gear.

Siemens & General Electric Railway Signal Co., Ltd., East Lane, Wembley.—Leaflet No. 119, describing a single-element vane type AC relay.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.—A 44-page illustrated booklet on metal rectifiers for telecommunication.

Aerialite, Ltd., Castle Works, Stalybridge.—A leaflet dealing with "Mastatic" anti-interference equipment and television aerials.

Bankruptcy Proceedings

G. Murray, 30, Elmstead Avenue, West Chislehurst, Kent, radio dealer (in the receiving order described as of 38, Elmstead Avenue, West Chislehurst, and in the petition as of the Brown House, Hextable, Swanley, Kent, and lately carrying on business at 119, High Street, Orpington, Kent).—At the public examination held at the Court House, Eastgate, Rochester, recently, debtor admitted that a contributory cause of his failure was his personal extravagance. His statement of affairs showed liabilities of £677, and assets of £84, leaving a deficiency of £593. He gave as other causes of his failure the depression in the trade in 1937 and heavy overhead expenses. The examination was closed.

G. E. Snailum, 160, Cromer Road, Hellesdon, Norfolk, lately trading as Ideal Electrical Co., 1 and 3, Timberhill, Norwich, electrical engineer.—The first meeting of creditors was held at the Official Receiver's Office, Castle Chambers, Opie Street, Norwich, on April 29th. Debtor had prepared a statement of affairs which showed ranking liabilities of £126 and assets of £15, leaving a deficiency of £111. The case being a summary one was left in the hands of the Official Receiver as trustee.

A. W. Schofield and **D. Tanner** (Schofield & Tanner), electrical and radio engineers, 673, Manchester Road, Denton.—Receiving order made April 19th on a creditor's petition.

A. Parsons, electrician, 23, Clifton Crescent South, Rotherham.—Discharged subject to consenting to judgment for £60 being entered against him by the Official Receiver. £60 paid to the Official Receiver in lieu of entering up judgment.

W. B. Smithers, electrical contractor, 11, Lunt Grove Avenue, Birmingham.—Trustee, Mr. F. C. Wells, 280A, High Street, Rochester, Official Receiver, released April 18th.

J. W. Colleer, radio dealer, Radio Stores, 3, Heybridge Street, Heybridge, Maldon.—Trustee, Mr. J. L. Poland, 29, Russell Square, London, W.C.1, Official Receiver, released April 24th.

F. W. Hirst, radio dealer, 1, Newlands Buildings, Marton Road, Middlesbrough.—Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, Official Receiver, released April 19th.

J. Bold, radio engineer, 37, Aylesbury Street, Bletchley.—Public examination May 12th at the County Hall, Northampton.

W. N. Smith, wireless dealer, 18, King Street, Dudley.—Trustee, Mr. K. V. Hooper, 1, Priory Street, Dudley, Official Receiver, released April 14th.

Company Liquidations

Marine Electrical Equipment Co., Ltd.—Meeting, May 30th, at 7, New Square, Lincoln's Inn, London, W.C.2, to receive an account of the winding-up by the liquidator, Mr. N. V. Brebner.

Eca-Ray Sales, Ltd.—Particulars of claims by May 5th to Mr. A. Cripwell, Balfour House, Finsbury Pavement, London, E.C.2, one of the liquidators.

Wood Electric Manufacturing Co., Ltd.—Meetings May 31st at 51-52, Chancery Lane, London, W.C.2, to receive an account of the winding-up by the liquidator, Mr. F. G. Baker.

Dissolution of Partnership

Marley Manufacturing Co., electrical suppliers, importers and factors, 119, New Cavendish Street, London, W.1.—Messrs. G. S. Barnes, E. W. Porch and P. N. Eden have dissolved partnership. Messrs. E. W. Porch and P. N. Eden will attend to debts and carry on the business.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

SIMANCO sewing machine motor

ELECTRICITY SUPPLY

Edmonton Council Regrets Distribution Bill Delay. Stalybridge Board and the Glossop Undertaking. Sunderland Street Lighting Control Scheme. Large American Plant Extension Project

Amble (Northumberland).—SUPPLY TO ESTATE.—Estimates are to be prepared of the cost of mains and services for the Ivy Street housing estate. Consideration is being given to the proposed installation of electric wash boilers on the estate.

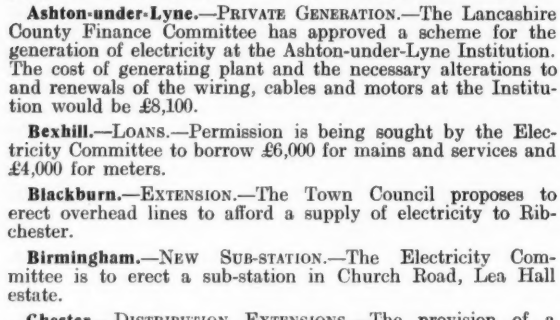
Ashton-under-Lyne.—PRIVATE GENERATION.—The Lancashire County Finance Committee has approved a scheme for the generation of electricity at the Ashton-under-Lyne Institution. The cost of generating plant and the necessary alterations to and renewals of the wiring, cables and motors at the Institution would be £8,100.

Bexhill.—LOANS.—Permission is being sought by the Electricity Committee to borrow £6,000 for mains and services and £4,000 for meters.

Blackburn.—EXTENSION.—The Town Council proposes to erect overhead lines to afford a supply of electricity to Ribchester.

Birmingham.—NEW SUB-STATION.—The Electricity Committee is to erect a sub-station in Church Road, Lea Hall estate.

Chester.—DISTRIBUTION EXTENSIONS.—The provision of a series of new high- and low-voltage lines, together with switchgear and transformers, has been recommended as follows: High-voltage line from the Red House to the Rake



[*Elec. News & Engineering*]

This sub-station in a residential area at Hamilton, Canada, is so much like a normal dwelling that circulars are frequently pushed under the door

and Pikel, £2,263; new high-voltage lines from the leadworks sub-station to Pearl Lane, £3,706; and low-voltage lines in Green Lane, Tarvin Road and Pearl Lane, £1,423; and new lines in Blacon to be installed in conjunction with the city surveyor's scheme for road works.

Coventry.—LOAN.—The Electricity Committee is applying for permission to borrow £18,944 for electrical equipment.

Croydon.—NEW SUB-STATION.—The Electricity Department is to erect a sub-station in Ardfern Avenue, Bensham Manor.

Durham.—PROPOSED SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station at Hart.

Eastbourne.—LOAN FOR DOMESTIC APPLIANCES.—The Electricity Committee is seeking sanction to borrow £10,000 for cookers, water heaters and other electrical apparatus.

Edmonton.—PROTEST AGAINST GOVERNMENT'S DELAY.—The failure of the Government to introduce the promised Electricity Bill was discussed by the Borough Council last week. The Council decided to support a resolution by the Southgate Council which expressed the view that the delay was resulting in the functions of municipalities possessing valuable public rights being impeded and paralysed.

Ald. Reid said that eight years ago the Council gave notice to the local electricity supply company to terminate its agreement, and asked the Ministry of Transport, through the Electricity Commissioners, to get on with a scheme. They paid several visits to the Ministry and were told it was a matter of a few weeks or months at most, but they had heard nothing yet.

Elland.—SUPPLY EXTENSIONS.—The Urban District Council proposes to lay cables from Westbury Street to the Heathfield housing estate at a cost of £1,014, and from the latter estate to Lower Edge Bottom, at a cost of £477. Application is to be made for consent to borrow these amounts.

Eston.—LOANS.—The Electricity Committee is seeking sanction to borrow £2,573 for sub-station equipment and £5,815 for mains and services.

Keighley.—LOW INDUSTRIAL HEATING CHARGE.—The Electricity Committee has decided to supply electricity for industrial heating at a net charge of 0.3d. per kWh, subject to the following conditions: The coal clause to apply; minimum quantity 250,000 kWh per annum; no supply to be taken during the peak load restriction period; no capital expenditure to be incurred by the Corporation in furnishing the supply; the supply to be metered and paid for separately from any other supply to the same premises.

Lancaster.—ADDITIONAL TRANSFORMING PLANT.—The Electricity Committee has approved proposals by the engineer for increasing the capacity of the transformers at the generating station. Application is to be made to the Electricity Commissioners for sanction to borrow £7,060 for the purchase of plant.

Leicester.—CONCRETE ROOF FOR POWER STATION.—The existing wooden roof at the city power station is to be replaced by a suspended flat concrete roof at an estimated cost of £30,000 to be met out of revenue. The steel supporting girders will be erected outside so that in case of fire they would not become involved and collapse beneath the weight of the roof.

London.—GREENWICH.—The Housing Committee is to install electricity in 87 dwellings at a cost of £1,000.

ST. PANCRAS ELECTRICITY CHARGES.—A number of increases in charges are proposed to offset the estimated deficiency during the current financial year, due to higher costs. The charges, which are to take effect after the meter readings for the quarter ending June next, include an increase from 2½d. to 3d. in the lighting flat rate. Other revisions affect the rental wiring (small dwellings) scheme, lighting supply to the Brookfield estate, prepayment meter supplies, and the kW demand system.

STREET LIGHTING IMPROVEMENTS.—A schedule of seven thoroughfares in which it is proposed to carry out lighting improvements was submitted to the St. Pancras Borough Council on Wednesday. The work is to be proceeded with during the ensuing half year and the cost will be £2,524 for lighting equipment and £1,316 for mains.

NORTH METROPOLITAN ELECTRIC SUPPLY BILL.—This Bill was considered on April 26th by the House of Lords Committee on Unopposed Bills. The measure authorises the transfer of the Hendon Electricity Co.'s undertaking to the North Met. Co. After formal evidence the Bill was ordered to be reported for third reading.

Mansfield.—NEW SUB-STATION.—An additional sub-station is to be provided on Radmanthwaite Road at a cost of £1,024 for the building, switchgear and transformer, &c., and £284 for cables.

Middlesbrough.—SUB-STATION EXTENSION.—The Town Council is to make additions to the Lime Street sub-station.

North West Midlands.—NEW GENERATING STATION.—The Stoke-on-Trent Council last week agreed to sell a plot of land now forming part of the Strongford sewage site to the North-West Midlands Joint Electricity Authority for the new power station to be built at Barlaston. It was also agreed that the whole of the effluent from the sewage works should be placed at the disposal of the authority for the new station.

London J.E.A. Hire Charges

AT its meeting last week the London and Home Counties Joint Electricity Authority approved certain changes in its hire facilities following consideration of a joint report by the chief engineer and the finance officer on the effect of increases in cooker rentals and charges for supply upon the revenue derived. These include the reversion to 10s. per quarter of the rental of the largest sized cooker let out on hire, which was increased to £1 under the revisions approved last September.

Another recommendation provided for the sale on hire purchase terms of cookers now in circuit on hire, for an amount which will reimburse the authority the balance, in each case, of any unredeemed capital expenditure; if desired, the authority will undertake to maintain the cookers on consumers' premises for 10s. per annum. A similar provision enables consumers to buy kettles now on hire.

It was also agreed that if consumers wish a radiant hot-plate shall be substituted for a "black" type on cookers hired at the revised rentals, or on the consumer paying the cost if the old rental applies.

Where an existing cooker and wiring are taken over by one consumer from another, it was agreed that the original rental should be continued, with an additional two-year minimum hire period.

Sharnbrook.—STREET LIGHTING.—The Council's agreement with the Rushden Electric Supply Co. for street lighting expires at the end of the present lighting season. A new agreement has been approved, providing for more powerful lamps and an extension of lighting hours.

Sheffield.—PROPOSED SUB-STATION.—The Electricity Committee is to erect a sub-station in Wilcox Road.

Shipley.—REDUCED HIRE CHARGES.—The charge for the hire of wash-boilers is to be reduced from 3s. to 2s. per quarter. Hand-operated washing machines are to be let out on hire at a charge of 5s. per quarter, and radiators at 1s. per quarter. In each case there is a further charge of 1s. per quarter where the wiring required exceeds a certain length.

Southend-on-Sea.—DISCHARGE LIGHTING.—The Town Council has approved the provision of mercury vapour lamps along the arterial road.

Southport.—AIR RAID PRECAUTIONS.—The electricity undertaking is about to embark on a scheme of air raid precautions, involving an expenditure of £5,820.

Stalybridge and District.—ACQUISITION OF GLOSSOP UNDERTAKING.—The Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board is to resume negotiations with the Urban Electric Supply Co. for the acquisition of the Glossop electricity undertaking. At a meeting of the Board's Parliamentary Committee a report was presented on the negotiations with the Central Electricity Board relating to the terms of the proposed agreement for supplying Glossop with electricity.

Stoke-on-Trent.—VOLTAGE REGULATION.—Owing to the increase in the general load in the Eastwood area of Hanley, the supply to the electric kiln of Johnson Bros. has been subject to varying voltage, and to remedy this a set of three single-phase Ferranti regulators is to be installed at an estimated cost of £240.

EXTENSION SCHEMES.—A sub-station is to be erected and mains extended at Fenton Low at a cost of £3,600, and extensions costing £875 are also to be carried out to Sandon Road, Meir. A supply is to be afforded at a cost of £280 to a new drill hall at Stonor Street, Cobridge.

ADDITIONAL SUPPLIES.—The Electricity Committee is to provide an additional supply to Basford and Newcastle at a cost of £8,750, and improve the supply to Bucknall at a cost of £5,250.

Sunderland.—STREET LIGHTING CONTROL.—Agreement has been reached by the Electricity Committee on the installation of a system of remote control of street lighting which can be used for sending out A.R.P. warnings. The scheme, which will cost about £17,300, will be submitted to the Town Council for approval. It is stated that the whole of the lighting would be centralised at Dunning Street sub-station, where, by button control, it could be switched on or off immediately.

Tynemouth.—BULK SUPPLY.—The Town Council has appointed a deputation to interview the North-Eastern Electric Supply Co., Ltd., on details of a scheme for providing a bulk supply of electricity to the borough.

METER REPLACEMENT.—Following the receipt of a report regarding the replacement of the two-coin meters which do not comply with the provisions of the Electricity Supply (Meters) Act, 1936, the Town Council has decided to set aside the sum of £4,000 annually during the next five years for replacing the meters.

Warrington.—EXTENSION.—The mains are to be extended to the R.A.F. Depôt at Burtonwood.

West Hartlepool.—WASH-BOILERS.—Electric wash-boilers are to be installed in houses on the Dyke House estate.

Weymouth.—LOAN.—Application is to be made for sanction to borrow £30,000 for mains and services, and £7,500 for the purchase of meters.

Wimbledon.—SUPPLY TO FACTORY.—The Electricity Committee has approved terms for a supply of electrical energy to the factory of E. Harris & Co., Ltd., on the Morden factory estate, Merton.

SUB-STATION SITE.—The Committee is to obtain a site in Belvedere Grove for a sub-station.

Overseas

America.—COMMONWEALTH EDISON EXTENSIONS.—The chairman of the Commonwealth Edison Co., of Chicago, announced at the recent annual meeting that the company was embarking upon a scheme of expansion to add 105,000 kW to its Powerton plant and 90,000 kW to the North-west station, to be ready next year and in 1941 respectively. During 1939 the company is spending $28,000,000 for construction purposes. The additional plant is required to cope with normal expansion and also to meet the requirements of the National Defence Power Committee, which aims at creating an emergency reserve of plant. The *Electrical World* says that the Assistant Secretary of War recently stated that in the latter connection a capacity of about 900,000 kW was ready for immediate installation or on order by the electric utility industry.

Denmark.—NEW POWER STATION.—Our Copenhagen correspondent reports that a large new thermal power station designed to supply electricity to Fredericia, Kolding, Vejle, and Horsens, is to be erected at Fredericia at an estimated cost of £1,000,000. The plant will utilise coal gas from an adjacent coking works.

ELECTRICITY CONSUMPTION IMPROVES.—The Board of Trade statistics for the first quarter of the current year show a total electricity consumption of 246 million kWh, as compared with 219 million kWh during the same period of last year. The national power industry was not able to meet this substantial increase, so that it became necessary to raise power imports from Sweden from 2.4 to 24 million kWh.

Northern Ireland.—GENERATION OF ELECTRICITY.—A Ministry of Commerce return shows that 78.0 million kWh was generated by authorised undertakings in Northern Ireland during the quarter ended March 31st, as compared with 68.0 million kWh in the corresponding quarter in 1938, an increase of nearly 15 per cent.

LOAN FOR ELECTRICITY BOARD.—Our Belfast correspondent reports that in a statement of guarantees given by the Ministry of Finance during the financial year ended March 31st, issued as a White Paper, it is revealed that the Ministry has guaranteed a loan of £150,000 to the Northern Ireland Electricity Board under the Electricity Supply Act. Sums amounting to £2,100,000 have already been guaranteed by the Ministry, making with the latest loan sanctioned, a total of £2,250,000. Of this amount £1,500,000 is in the form of Electricity Board 1955-60 3 per cent. guaranteed stock, and the balance of £750,000 in the form of 3½ per cent. guaranteed bonds, maturing on March 31st, 1944.

Norway.—MEETING INCREASED DEMAND.—The rapid growth of electricity consumption in Norway has caused the Government to appoint a special investigation committee. A scheme has been suggested for the extension of the Government's Norekraft station by adding four 25,000-kW sets during the next ten years. The present capacity of the station is about 125,000 kW. The committee has further investigated the possibilities of harnessing the large power resources available at the Aurafallene falls. A scheme comprising four stages of construction has been suggested, by means of which about 220,000 kW would be available. The Oslo Municipality has purchased the waterfall rights at the Vatna and Holsvassdraget falls. From these sources an additional 30,000 kW will be derived for the metropolitan supply system. The Arendal Municipality has ordered the erection of a new water-power plant at Evenstad. Two 6,000-kW sets are being installed, and a third unit is to be added later, increasing the total capacity to 18,000 kW.

Palestine.—INCREASE IN ELECTRICITY USED.—Electricity used in Palestine has increased from 58 to 105 kWh per head during the last four years, according to the Jerusalem *Economist*. A feature of the supply in Palestine is the amount used for agricultural purposes. Last year the Palestine Electric Corporation sold 25,502,000 kWh to farmers, 5,000,000 kWh more than for industrial uses.

Russia.—NEW POWER PLANT.—A ninth turbine is shortly to be brought into operation at Dneproges, which will increase the capacity of the system to 560,000 kW.

Sweden.—EXPANDING WATER-POWER INDUSTRY.—It was stated at a recent meeting of the National Association of Water-power Producers that new plants representing a total capacity of 330,000 kW were in course of construction. Building operations by the State Waterfalls Board accounted for about 60 per cent. of this.

Turkey.—NEW POWER STATION.—It is announced that the Turkish Minister of Public works has now sanctioned the erection of the proposed large power station near Mugla and that public tenders will be invited for the execution of the work. Further hydro-electric works are to be established in six other Anatolian localities, the plans for which have already been approved.

Mining Convention

THE annual convention of the Association of Mining Electrical Engineers is to be held from June 20th to 24th at Sheffield, the programme being as follows:—

Tuesday, June 20th.—Afternoon golf competition and informal evening reception.

Wednesday, June 21st.—All-day visit to the Stafford works of the English Electric Co., Ltd.

Thursday, June 22nd.—Morning visit to the steel works of Hadfields, Ltd., at Sheffield, with an alternative choice for the ladies to see how silversmiths work at the factory of Walker & Hall, Ltd. After luncheon (Baldwins, Ltd.) at the Firbeck Club, near Worksop, there will be an afternoon coach drive and a civic reception and dance at the Town Hall, Sheffield, in the evening.

Friday, June 23rd.—Morning visit to the Izal works of Newton, Chambers & Co., Ltd. Meanwhile the general council meeting will be held, followed by the annual general meeting in the afternoon. The A.M.E.E. annual dinner and dance will take place at the Royal Victoria Hotel, which is to be the headquarters. The convention secretary is Mr. C. A. Coates, 59, Whirlowdale Crescent, Sheffield, 7.

COMMUNICATIONS

St. Helena.—NEW BROADCASTING STATION.—The *Revue des Téléphones, Télégraphes et T.S.F.* announces that work is in progress on the establishment of a radio broadcasting station on the island of St. Helena.

A winter view of the Brocken mountain, Germany, showing on the right the wooden building of the new television station which is shortly to start transmitting

Sweden.—POPULARITY OF TELEPHONES.—A statistical survey issued recently by the Post Office shows that the number of telephone exchanges rose from 6,393 in 1937 to 6,575 in 1938, and the number of subscribers from 724,595 to 786,500. This increase of about 62,000 was the largest on record. The efficiency with which the Swedish telephone system operates is to no small extent due to the adoption of automatic devices designed to relieve operators of tedious work which used to affect the speed of response to subscribers' calls.

TRACTION

Bradford.—NEW TROLLEY-BUS ROUTE.—It is anticipated that the Bradford Crossflats tramway route will be converted to trolley-bus operation by Whitsun. Trial runs have already been made.

Norway.—RAILWAY ELECTRIFICATION.—The Government has ordered the electrification of the Bergen-Voss and Nordagatu-Kristiansand railways at a cost of £580,000 and £800,000 respectively. It is further planned to electrify the Lillestrom-Hamar and Kongsvinger-Vestfoldbanen lines.

South Shields.—TROLLEY VEHICLES BILL.—The Select Committee of the House of Commons on Unopposed Bills had before it on April 26th a Bill promoted by the Ministry of Transport to confirm a Provisional Order relating to trolley vehicles in South Shields Mr. Clark, of the Ministry of Transport, said that the Corporation was already authorised to use trolley vehicles and had 14 miles of route in operation. It was now proposed to make an extension of about 2¼ miles. The preamble was found proved and the Bill was ordered to be reported for third reading.

Drying by Near Infra-red Rays

SOME 35,000 tungsten 250-W lamps are now used by the Ford Motor Co. at Dearborn (Mich.) for drying the paintwork of motor cars. The lamps are in tunnels of gold-plated parabolic concentrating reflectors mounted from 9 to 18 in. from the automobile body. According to the *General Electric Review* the lamps are run at a temperature of 2,500 K instead of the 3,000 K used for illumination and, having a light output of only one-third that of the standard lamp, they last from 10,000 to 20,000 hours and there is no sensation of heat at the backs of the reflectors. At that temperature they produce the wavelength most effective for vaporising the commonest solvents and washes.

The energy of a wavelength greater than 14,000 A° will be wholly absorbed as heat by an appreciable thickness of water. On the other hand, evaporation is accelerated if the water is heated throughout and not at the surface alone. As all radiant heaters supply some energy at wavelengths greater than 14,000 A°, the colour temperature of the source will determine the penetration.

A source of 3,000 K is required to penetrate water, while the energy from a source of 1,000 K will be largely absorbed in the first millimetre. The drying lamp at 2,500 K (the melting point of tungsten being 3,817 K) represents a suitable balance between absorption and penetration.

At the Ford Co.'s works the prime coat on the car is dried in 7 min. as against 30 min. previously. Finishing coats require about 14 min. as against 80 min. with methods formerly used.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Thursday, May 11th. Institution, London, W.C.2. 6 p.m. Annual general meeting. Faraday Lecture on "The Long Distance Telephone Call," by Capt. B. S. Cohen.

Meter and Instrument Section.—Friday, May 5th. Institution, London, W.C.2. 7 p.m. "Permanent Magnets," by D. A. Oliver.

Saturday, May 6th. Summer visit to the Post Office Research Station at Dollis Hill and to Windsor Castle.

Transmission Section.—Wednesday, May 10th. Institution, London, W.C.2. 6 p.m. "Superimposed Control Applications, with Special Reference to Tariffs and Load Levelling," by D. J. Bolton.

Hampshire Sub-Centre.—Wednesday, May 10th. Municipal College, Portsmouth. 7.30 p.m. "The Marconi-E.M.I. Television System," by Messrs. A. D. Blumlein, C. O. Browne, N. E. Davis and E. Green.

Birmingham Electric Club.—Friday, May 5th. Summer visit to the works of the Chloride Electrical Storage Co., Ltd., Manchester.

Institution of Civil Engineers.—Tuesday, May 9th. Great George Street, Westminster, S.W.1. 6 p.m. Annual general meeting.

Illuminating Engineering Society.—Tuesday, May 9th. Storey's Gate, St. James's Park, London, S.W.1. 7 p.m. Annual general meeting.

Association of Mining Electrical Engineers (*North of England Branch*).—Saturday, May 13th. Mining Institute, Neville Hall, Newcastle-on-Tyne. 3 p.m. Annual general meeting.

The I.E.E. Summer Meeting

WHILE the programme of the summer meeting of the Institution of Electrical Engineers in Manchester and district indicates that the last date for receiving entry forms has expired, this is no doubt nominal and applications can still be accepted provided they are not too long delayed. The following is a summary of the programme:—

Monday, June 19th.—Evening. Informal reunion at the Midland Hotel, the headquarters.

Tuesday, June 20th.—Morning. Alternative visits to the battery works of the Chloride Electrical Storage Co., Ltd., or (principally ladies) the Newton Heath handkerchief factory of Tootal Broadhurst Lee & Co., Ltd.

Afternoon. Alternative visits to the Kearsley power station of the Lancashire Electric Power Co., or its meter and domestic appliance testing station.

Evening. Civic reception and dancing at the Town Hall, Manchester.

Wednesday, June 21st.—Morning. Alternative visits to the Barton refinery of the Manchester Oil Refinery, Ltd., or the Barton power station of the Manchester Corporation.

Afternoon. Tour of the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd.

Evening. Civic reception and dancing at the Royal Art Gallery, Salford.

Thursday, June 22nd.—All-day excursion and cruise on Lake Windermere.

Evening. Reception, dancing and exhibits at the University, Manchester.

Friday, June 23rd.—Morning. Visit to the Irlam works of the Lancashire Steel Corporation, Ltd., while the ladies will go to the Irlam soap works of the Co-operative Wholesale Society, Ltd.

Afternoon. Visit to the Park Works of Mather & Platt, Ltd.

Evening. Dance and cabaret at the Midland Hotel, Manchester.

Supply in Emergency

AT a meeting of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) held on April 21st, the following resolution was adopted:—

"That in view of the importance of maintaining the supply and distribution of electricity in the case of national emergency this Board is willing to set up a Committee to consider all matters relating to the maintenance of the necessary personnel. That such Committee consist of the following members, and be empowered to take any necessary action under this resolution: Alderman Sir Percival Bower, Alderman W. Walker, Col. S. E. Monkhouse, Mr. S. S. Scott, Mr. C. D. Taite, Mr. G. Gunn, Mr. L. Hoskison, Mr. P. S. Jolin, Mr. J. W. Thomas, Mr. P. L. Weir, Mr. W. A. Jones.

"That the terms of this resolution be communicated to the appropriate Government Department with a request that no approach should be made to persons employed in the electricity supply industry except after consultation with this committee."

The National Joint Board considers it essential that recruitment from the industry in case of war should be considered by a body with full knowledge of the requirements of the industry, and of its present personnel, in order that the supply might not be imperilled. A similar committee has been established by the National Joint Industrial Council, and it is contemplated that the two committees will have to combine.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares.

New Companies Registered

Allan Monkhouse, Ltd.—Private company. Registered April 28th. Capital, £100. Objects: To carry on the business of manufacturers and distributors of and agents for all types of electrical and mechanical machinery, appliances, equipment, implements, vehicles, apparatus, or tools for use in connection with horticulture, agriculture, the packing and storage of food products or the supply and distribution of electrical energy to rural and urban districts, &c. Directors: A. Monkhouse and A. D. Monkhouse, both of Delgarth, Harpenden.

British Electrical Sales Agency, Ltd.—Private company. Registered April 29th. Capital, £2,500. Objects: To carry on the business of designers and manufacturers, importers and exporters of and dealers in electric light and other electrical apparatus, conduits, dynamo machines, electric generators, accumulators, switchgear, cable and wire, cable casings, &c. Directors: A. E. Andrews, 104, High Holborn, W.C.1; and J. W. Sholto Gray, 35, Belsize Park, N.W.3.

Harry Glick, Ltd.—Private company. Registered April 28th. Capital, £1,000. Objects: To carry on the business of dealers in wireless goods and accessories and electrical goods and fittings, &c. Subscribers: T. A. Powell, Norwood, Manor Way, Whitchurch, near Cardiff; and D. B. Pryor, 95, Arabella Street, Cardiff. Secretary (pro. tem.): M. Roberts. Registered office: 8, Dumfries Place, Cardiff.

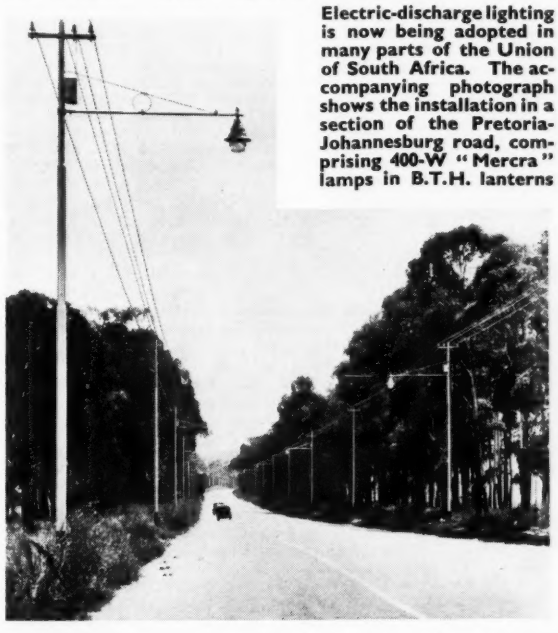
Drazin, Ltd.—Private company. Registered April 19th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in wireless, television and sound-producing machines, &c. I. Drazin, 57/59, Heath Street, Hampstead, N.W.3, is first and permanent director. Registered office: 57/59, Heath Street, Hampstead, N.W.3.

Hector Engineering Co., Ltd.—Private company. Registered April 27th. Capital, £2,000. Objects: To carry on the business of manufacturers and designers of and dealers in Diesel, gas, electric, heat, petrol and steam engines, ironmasters, ironworkers, steel makers, &c. Directors: G. J. Ellis, Tresco, Hillbrow Road, Bromley, Kent; and N. Reiter, 38, Harrington Crescent, W.9.

Dynamo and Electrical Services, Ltd.—Private company. Registered April 27th. Capital, £3,000. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, magnetos, armatures, motors, electrical plant, motor vehicles, &c. Directors: T. Blackshaw, "Rivoli," 6, Gorse Road, Blackburn; G. F. Bradshaw and Mrs. Iris Bradshaw, both of 60, Parsonage Road, Blackburn; and J. Blackshaw, "Rivoli," 6, Gorse Road, Blackburn. Solicitors: Wm. Slater, 23, Richmond Terrace, Blackburn.

J. Beagelman, Ltd.—Private company. Registered April 26th. Capital, £1,000. Objects: To acquire the business carried on by J. Beagelman at 75, Knightrider Street, E.C.4, and to carry on the business of general merchants, manufacturers of and dealers in wireless and television apparatus and electrical appliances, &c. The directors are: J. Beagelman, 31, Ashworth Mansions, Elgin Avenue, W.9; and L. Holstadter, 115, Greencroft Gardens, N.W.6 (permanent managing director). Registered office: 75, Knightrider Street, E.C.4.

Russell & Purdom, Ltd.—Private company. Registered April 22. Capital, £100. Objects: To carry on the business of radio and electrical service engineers, &c. Directors: Mrs. E. Russell, 3, Park Hill Road, Walmley, Birmingham; T. W. Purdom, 440, Chester Road, New Oscott, Birmingham; and K. C. Russell, 44, Moor End Lane, Erdington, Birmingham. Secretary: K. C. Russell. Registered office: 85, Edmund Street, Birmingham.



Electric-discharge lighting is now being adopted in many parts of the Union of South Africa. The accompanying photograph shows the installation in a section of the Pretoria-Johannesburg road, comprising 400-W "Mercra" lamps in B.T.H. lanterns

Hidderley Radio Sales, Ltd.—Private company. Registered April 26th. Capital, £1,000. Objects: To carry on business as

Egypt's Electrical Imports

Another Advance Last Year

EGYPT'S electrical imports last year rose in value by £E150,000 as compared with 1937, the total being £E865,000.

The following table, which is compiled from the official monthly returns of the foreign trade of Egypt, gives the values of the imports of the principal groups and in a few instances the chief countries of supply. Notes of increases or decreases compared with 1937 are added. (The Egyptian £ equals approximately £1 0s. 6d.)

General prospects for import trade during the current year are rather less promising. Last year Egypt's foreign trade resulted, for the first time in seven years, in an adverse balance, and the country's purchasing power is affected by the uncertainty of the cotton market. Although house-building has declined there is continued activity in construction work connected with defence, and factory projects are fairly numerous.

The budget situation is satisfactory. Revenue during the past year or two has been sufficient to cover expenditure on national defence, with the exception of that incurred on some special items, the cost of which is being met from reserve funds.

	1938 £E (000)	Inc. or dec. on 1937 £E (000)
Generators, motors and transformers, 1,000 kW or over—		
Total	52	+17
From United Kingdom	5	− 5
,, Germany	17	+ 9
Ditto, 50 to less than 1,000 kW —		
Total	64	+29
From United Kingdom	14	+ 2
,, Germany	10	+ 4
Ditto, less than 50 kW —		
Total	16	+ 1
Dry batteries and parts—		
Total	22	+ 2
Accumulators and parts—		
Total	26	− 5
From United Kingdom	8	− 8
,, Germany	6	− 1
,, United States	5	+ 1
Fans, electric—		
Total	4	− 1
Radio valves—		
Total	7	− 2
Electro-medical apparatus—		
Total	27	+ 2
Electric lamps up to 40 W—		
Total	28	+ 1
Electric lamps 40-60 W—		
Total	7	—
Electric lamps over 60 W—		
Total	17	+ 4
Telegraph and telephone apparatus—		
Total	45	+11
From United Kingdom	27	− 1
Radio receiving sets—		
Total	108	−17
From United Kingdom	16	− 1
,, Germany	10	—
,, Holland	27	− 5
,, United States	46	−10
Parts for radio apparatus—		
Total	21	+ 8
Submarine and underground insulated cable—		
Total	106	+34
From United Kingdom	23	+22
,, Belgium	19	−13
,, France	29	+21
,, Germany	19	− 5
Other insulated wire and cable—		
Total	51	+ 9
From United Kingdom	8	+ 3
,, Belgium	12	− 1
,, Germany	14	+ 1
Insulated tubes, metal-covered—		
Total	6	+ 1
Domestic irons—		
Total	1	—
Refrigerators—		
Total	10	+ 2
Water heaters—		
Total	1	− 1
Other domestic apparatus—		
Total	17	+ 6
Electrical apparatus, not specified—		
Total	210	+48

manufacturers of and dealers in wireless and television sets and apparatus, &c. Permanent directors: W. A. Southam, 27, Hurdsfield Road, Stockport, and W. Norcross, 18, Graham Road, Stockport.

"Solus" Electrical Co., Ltd.—Private company. Registered April 19th. Capital, £25,000. Objects: To acquire the business of X-ray and radium specialists heretofore carried on by the "Solus" Electrical Co. at 69, 71 & 100, Judd Street, W.C.1. Directors: E. J. W. Watkinson, 2, Cavendish Avenue, Finchley, N.3, and A. C. Gunstone, 36, Woodside Close, Amersham, Bucks. Registered office: 46, Baker Street, W.1.

Returns of Electrical Companies

Statements of Capital

Crompton Parkinson, Ltd.—Capital, £2,000,000 in 200,000 1st preference and 500,000 2nd preference shares of £1 and 600,000 ordinary and 4,600,000 "A" ordinary shares of 5s. Return dated December 30th, 1938. 170,725 1st preference, 500,000 2nd preference, 600,000 ordinary and 2,678,513 "A" ordinary shares taken up. £637,654 2s. 8d. paid (£1 on 6,965 1st preference and 423,238 2nd preference, 5s. on 200,000 ordinary and 426,680 "A" ordinary, and 7s. 6d. on 133,760 1st preference and including £621 2s. 8d. paid on forfeited shares). £853,320 5s. considered as paid (£1 on 30,000 1st preference and 76,762 2nd preference, 5s. on 400,000 ordinary and 2,251,833 "A" ordinary and 12s. 6d. on 133,760 1st preference). Mortgages and charges, nil. A return of allotments made up to March 24th, 1939, shows a further 1,639,256 "A" ordinary shares allotted as fully paid by way of "bonus."

Aldwych Lamp Co., Ltd.—Capital, £25,000 in 20,000 ordinary shares of 1s. each and 96,000 preference shares of 5s. Return dated January 14th, 1939. 20,000 ordinary and 27,160 preference shares taken up. £7,740 paid on 20,000 ordinary and 26,960 preference shares. £50 considered as paid on 200 preference shares. Mortgages and charges, nil.

Arctic Fan & Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated January 14th, 1939. Two shares taken up. £2 paid. Mortgages and charges, nil.

Electric Supplies and Repairs, Ltd.—Capital, £2,500 in £1 shares. Return dated January 14th, 1939. 2,460 shares taken up. £2,460 paid. Mortgages and charges, nil.

Sydney R. Hare & Son, Ltd.—Capital, £3,000 in £1 shares. Return dated January 17th, 1939. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Bartrum Roylance & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1938 (filed March 6th, 1939). 2,500 shares taken up. £2,500 paid. Mortgages and charges, £1,181 5s. 4d.

Coventry Electrical Appliances, Ltd.—Capital, £10,000 in £1 shares. Return dated July 26th, 1938 (filed February 6th, 1939). 5,187 shares taken up. £5,137 paid. £50 considered as paid. Mortgages and charges, nil.

Electric Refrigeration Sales and Services, Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1938 (filed April 4th, 1939). 150 shares taken up. £75 (10s. per share) paid. Mortgages and charges, nil.

Electric Legal Utility Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1938 (filed April 3rd, 1939). All shares taken up. £500 paid. Mortgages and charges, nil.

British Electric Refrigerator Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1938 (filed February 16th, 1939). 50 shares taken up. £50 paid. Mortgages and charges, nil.

Electric Rollers, Ltd.—Capital, £500 in £1 shares. Return dated August 15th, 1938 (filed March 23rd, 1939). All shares taken up. £500 paid. Mortgages and charges, nil.

Express Cable Engineering Co., Ltd.—Capital, £300 in £1 shares. Return dated December 5th, 1938. 141 shares taken up. £141 paid. Mortgages and charges, nil.

Electric Service Company (Birmingham), Ltd.—Capital, £2,500 in £1 shares. Return dated December 19th, 1938 (filed February 6th, 1939). All shares taken up. £1,250 paid. £1,250 considered as paid. Mortgages and charges, nil.

Electric Services (Liverpool), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1938 (filed February 24th, 1939). 152 shares taken up. £152 paid. Mortgages and charges, nil.

Electromobile Engineering Company (West Bromwich), Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1938 (filed January 30th, 1939). 482 shares taken up. £482 paid. Mortgages and charges, nil.

United Electric Lamp Factories, Ltd.—Capital, £100 in £1 shares. Return dated December 21st, 1938 (filed March 20th, 1939). 12 shares taken up. £12 paid. Mortgages and charges, nil.

British Electric Resistance Co., Ltd.—Capital, £50,000 in 2s. shares. Return dated November 16th, 1938 (filed January 4th, 1939). 500,000 shares taken up. £10,100 paid on 101,000 shares. £39,900 considered as paid on 399,900 shares. Mortgages and charges, nil.

Caledonian Electric Services, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1938. All shares taken up. £1,000 paid. Mortgages and charges, £200.

Carbo Electric Corporation, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1938 (filed February 28th, 1939). Two shares taken up. £2 paid. Mortgages and charges, nil.

Blockley Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1938. All shares taken up. £1,000 paid. Mortgages and charges, nil.

British General Manufacturing Co., Ltd.—Capital, £500 in £1 shares. Return dated December 12th, 1938 (filed February 28th, 1939). All shares taken up. £2 paid. £498 considered as paid. Mortgages and charges, nil.

Albion Electric Lamp Works (1934), Ltd.—Capital, £7,500 in £1 shares. Return dated March 31st, 1938 (filed March 30th, 1939). 7,449 shares taken up. £3,349 paid. £4,100 considered as paid. Mortgages and charges, nil.

Keighley Electrical Engineering Co., Ltd.—Capital, £10,000 in 3,000 preference and 7,000 ordinary shares of £1. Return dated October 31st, 1938 (filed February 15th, 1939). 2,300 preference and 4,256 ordinary shares taken up. £4,544 paid on 1,900 preference and 2,644 ordinary shares. £2,012 considered as paid on the remainder. Mortgages and charges, £7,500.

Mortgages and Charges

New Hearing, Ltd.—Particulars filed of £500 debentures authorised April 18th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Anderton & Clift, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 6th, 1939, to secure £800. Holder: Edwin Steiner, 324, Pershore Road, Edgbaston, Birmingham.

Sir George Godfrey & Partners, Ltd.—Mortgage and further charge on land and premises at Hampton Road, Hanworth, Middlesex, dated April 12th, 1939, to secure £475 and for further securing £890 now owing under a mortgage dated July 13th, 1938, and any arrears of interest which may be capitalised. Holders: Credit for Industry, Ltd., Regis House, King William Street, E.C.

Superlamp, Ltd.—Satisfaction on April 18th, 1939, of (a) charge dated December 24th, 1932, and registered August 6th, 1937, and (b) to the extent of £500 on same date of charge dated April 10th, 1935, and registered August 6th, 1937.

Receivers Released and Appointed

Electric Homes, Ltd.—J. E. Bardrick, of Walsingham House, Pepys Street, E.C., was appointed receiver and manager on April 20th, 1939, under powers contained in debenture dated April 14th, 1939.

Arctic Fan & Electrical Co., Ltd.—Henry O. Thorp, F.C.I.S., of 82, The Vale, N.W.11, was appointed receiver and manager on April 18th, 1939, under powers contained in debenture dated February 3rd, 1939.

Increases of Capital

R. A. Poole (London), Ltd.—The nominal capital has been increased by the addition of £4,000, in £1 ordinary shares, beyond the registered capital of £1,000.

Modern Telephone Co., Ltd.—The nominal capital has been increased by the addition of £3,000 in £1 shares beyond the registered capital of £12,000.

Cambridge Instrument Co., Ltd.—The nominal capital has been increased by the addition of £60,000, in £1 ordinary shares, beyond the registered capital of £240,000.

Baird Television, Ltd.—The nominal capital has been increased by the addition of £400,000 beyond the registered capital of £1,087,500. The additional capital is divided into 3,200,000 25 per cent. non-cumulative participating preference shares of 2s. 6d. each.

Reports and Dividends

W. T. Henley's Telegraph Works Co., Ltd., held its annual meeting on April 28th, when Sir Montague Hughman (chairman), who presided, in referring to national service, said that every possible encouragement and facility was given for members of the staff and workpeople to take part. Those who took up this work were granted leave of absence for training with allowances, including holidays with pay.

The results of their company for 1938 were very satisfactory, and they had almost reached the record figures of 1937 and had easily beaten the records of their centenary year, 1936. A bonus was being paid to the staff and the hourly paid workers. A considerable amount of work was being carried out by the company, and also by the subsidiary companies, in connection with the Government's defence programme. The works had been fully occupied during the year, and they had been able to find continuous employment for an increased number of staff and workpeople and had beaten all previous records.

The business for 1938 had resulted in a profit only slightly less than that for 1937, which was a record year. The turnover was slightly lower, mainly on account of the lower prices ruling during the year, while the business of the subsidiary companies was in total better than in 1937, the profits in the aggregate being substantial. The trading of their overseas branches had again proved satisfactory, substantial profits being made at each branch. During one period of the year a record output of rubber covered cables was reached. The considerable building extensions which they had been carrying out during the last few years had been completed, and at Gravesend the extensions to their factory had been completed. The extensions housed a complete new high-voltage station which was up to date in every respect. The increasing voltages which were used in power transmission to-day had necessitated the use of even higher and more stringent testing arrangements, and the high-voltage part of their laboratories had therefore been completely redesigned. The engineering department maintained its activity at the same high level as in 1937. New designs had been produced and marketed during the year, and new machinery had had to be installed to keep pace with production. This department was requiring further extensions so as to ensure that manufacturing costs might be kept as low as possible by proper organisation of production, and these were to be proceeded with immediately.

The research laboratories had maintained a high standard of efficiency. One interesting development was the discovery of a means of filling a cable joint with a compound which did not require the application of heat. In all developments they had worked in close collaboration with other cable makers. During the year under review the contract department had carried out a considerable amount of work of national importance for the Admiralty, War Office, and Air Ministry. Their South African company, Henley's (South Africa) Telegraph Works Co., Ltd., had made a fresh record in profits, and

business continued good during the present year. With regard to their overseas business, their work in India, Australia and New Zealand had shown considerable expansion. They would continue to consolidate their position in the export markets and to extend their activities wherever possible. During 1938 they obtained a good share of the business which was placed by the Dominions and Colonies. In addition, they had important orders from South America, including one for 20,000-V cable. They must face the fact that the tendency towards the establishment of cable factories overseas would reduce the volume of business which was done from their home factories.

Henley's Tyre and Rubber Co., Ltd., had more than maintained the increase in turnover referred to last year, and there was a large increase in the turnover of the Holborn Construction Co., Ltd. For the first quarter of the current year they had done a substantial business, and with no disturbing factors to hinder them, 1939 should be a good year for the stockholders.

Mr. W. F. Bishop, in seconding the resolution for the adoption of the report and accounts, said that on the cable side they continued to secure a large proportion of the business placed in connection with new ship construction, both naval and commercial. Cables for the *Queen Elizabeth* were delivered during 1938, and they were also supplying a large proportion of the cables for the new *Mauretania*. At the present time they had in hand more "super" voltage cable work than ever before, including a large contract in connection with the new Littlebrook power station of the Kent Electric Power Co., which included 66,000- and 132,000-V cables. Their export trade continued to be mainly to the British Dominions and had been reasonably satisfactory during 1938, but outside the British Empire, apart from two or three other countries in which some progress was shown, the economic and political situation had made it difficult, if not impossible, to do business on reasonable lines.

Laurence, Scott & Electromotors, Ltd., held their annual meeting on April 26th, when Mr. G. J. Scott (chairman), who presided, said that international tension during the year resulted in such a world-wide fall of business confidence that their orders for electrical machinery for the industrial market were considerably reduced in volume, but they had more than maintained their share of the business available, and any relaxation of international tension would have a marked effect on this branch of their business. They had taken steps to extend their activities still further in the industrial market by obtaining the services of one of the greatest electrical engineers in Germany, and had thereby been able to enter a new field in electrical engineering which would be of great value both in the home market and overseas.

In the marine market their orders had been adversely affected by the subsidising of both shipbuilding and shipowning by certain foreign countries, and by the loss of orders for ships in this country caused by barter agreements between other countries. In spite of exchange difficulties they had received orders for special electrical machinery from European countries. During the last three years the Norwich and Manchester works had been re-equipped with modern machinery, involving capital expenditure of approximately £289,000.

The Southern Areas Electric Corporation, Ltd.—Presiding at the annual meeting held on April 28th Viscount Elibank (chairman) said that as the result of new legislation affecting the coal industry there had been an increase in the cost of coal, which might yet go further. They estimated that increased coal cost and maximum demand charges would have been approximately £2,700 less had conditions in 1938 been more normal. Coincident with these increased costs were certain tariff reductions which operated during the year in favour of their consumers in some of their areas. Taking their undertakings as a whole, the lower average price per kWh received during the year represented a reduction of £4,600 in the total revenue they received from the sale of electricity, as compared with what they would have collected had their 1938 charges been the same as those in 1937. These factors had been mainly responsible for the profits for 1938 being £31,985 as compared with £37,953 in 1937. If costs continued to rise, they might be compelled to raise their tariffs in some areas.

During 1938 the kWh sold increased by approximately 14 per cent., but their gross receipts from the sale of electricity increased by less than 10 per cent. There was an 8 per cent. increase in the number of new consumers connected to the mains. Their investments in other companies totalled £64,171. They had taken an interest in another small electrical manufacturing company, and had acquired a substantial interest in an electric cable manufacturing company. Once again a new high record of output and profits had been achieved at the works of their electrical manufacturing subsidiary.

The Oriental Telephone & Electric Co., Ltd.—Presiding at the annual meeting held on April 25th, Sir A. Henry McMahon (chairman), in referring to the working of their branches, said that Singapore had shown a moderate increase this year, and the number of subscribers had passed the peak which was reached in the year prior to the financial depression. With regard to Mauritius, the undertaking there was transferred to the Government in July last year. This branch had been worked at a loss for some years, and with the transfer of the business this charge would no longer have to be borne.

Their subsidiary and associated companies, the Bengal Telephone Corporation, the Madras Telephone Co., the Bombay Telephone Co. and the Rangoon Telephone Co. had all paid their customary dividends, and while in every instance development had not been so great in 1938 as in 1937, the increase in the number of exchange lines was satisfactory.

With regard to the China & Japan Telephone Co., and the Hong Kong Telephone Co., the latter had made a distribution for the year amounting to 12 per cent., which had enabled the China Co. to pay a dividend of 6 per cent. These rates were the same as those distributed in recent years. The growth of business in Hong Kong and Kowloon had continued at an even greater rate in 1938 than in previous years, but this increase was abnormal and might not be expected to continue.

The North Somerset Electric Supply Co., Ltd.—Presiding at the annual meeting on April 19th Mr. J. H. Woodington (chairman) said that the year under review had been one of continued expansion. The 33,000-V ring main had been completed and extensions had been made to the 11,000-V system which had enabled them to afford supplies to twenty-two new districts. The number of new consumers connected was 2,514, an increase of 12½ per cent., bringing the total to 23,352, and at the end of the year they had in commission 293 transforming stations and 912 miles of mains. The special tariffs quoted for industrial loads under long term agreements had continued to prove attractive, and they had negotiated a number of new contracts representing an additional aggregate load of 2,250 kW. The number of installations under their free-wiring scheme was 3,994, an increase of 781, while the cookers connected totalled over 3,000, a rise of 564. The two subsidiary undertakings at Burnham and Street continued to progress. During the first three months of the current year the sales of electricity showed an increase of 9.9 per cent. over the corresponding period of last year. Mr. F. Christy seconded the motion for the adoption of the report and accounts.

Babcock & Wilcox, Ltd., report a profit for 1938 of £829,431, as compared with £607,293, which, with dividends and interest on investments, etc., makes £944,038. The net profit is £809,902 (against £601,058), from which is deducted contributions to staff pension funds (£29,038), and, after adding £96,648 brought in, the balance available is £877,512. Provision for income tax requires £193,000, and for civil defence, including A.R.P., £25,000. The final ordinary dividend is 6 per cent., making 10 per cent. for the year (same), plus a bonus of 2½ per cent. (against nil), making a total distribution of 12½ per cent. The balance carried forward is £107,102. The total volume of business in the home and export markets was practically the same as in 1937, being at a satisfactorily high level. The plant additions which have been made during the last few years are now producing their full results, and these are in part responsible for the increased profits which are shown in the present balance sheet. The increased profit is also partly due to a greater output during the year following on the increased volume of business during the last two years. Meeting: May 11th.

Johnson & Phillips, Ltd., report a profit for 1938 of £205,639, after making provision for bad debts and after charging to revenue upwards of £16,000 for maintenance of buildings, plant, &c. This compares with £201,192 for 1937, and after deducting remuneration of directors (£2,465); auditors' and trustees' fees (£630); debenture interest (£17,435); reserve for debenture sinking fund (£4,565); depreciation of machinery, plant, &c. (£27,228) pensions and group life assurance (£4,277); and income tax and N.D.C. (£15,552), there remains £133,487, to which is added £102,647 brought in, making £236,134. From this £7,000 is placed to research and development account, £5,000 to dividend equalisation account and £20,000 to special reserve for contingencies. The final ordinary dividend is 7½ per cent., making 12½ per cent. for the year (same) and £104,134 is carried forward. Meeting: May 11th.

The Great Northern Telegraph Co., Ltd., reports gross receipts for 1938 of £986,624, including £262,506 from interest on investments. Working expenses amount to £598,838. Adding the balance brought forward from 1937, *viz.*, £469,976, the sum available for disposal is £857,761. It is proposed to pay a total dividend and bonus of 20 per cent. (including the 5 per cent. already paid), payable in sterling, leaving a balance of £457,761 to be carried forward. The above-mentioned amounts have been converted into sterling at the rate ruling on December 31st., *viz.*, £1=Kr.22.40.

The Ever Ready Co. (Great Britain), Ltd., proposes to pay a final dividend of 15 per cent. on the ordinary stock, making 30 per cent. for the year to March 31st (against 35 per cent. for 1937-38). Subject to completion of audit, the net profit for the past year is £456,958, as compared with £531,575 in the preceding year. The volume of sales in the home market increased by approximately 5 per cent., the lower profit being due to price competition and to a fall in receipts from overseas and subsidiary companies.

Electrical Switchgear & Associated Manufacturers, Ltd., has decided to pay the half-year's dividend on the preference shares when due on June 1st and not to pay an interim dividend on the ordinary shares but to conserve the cash resources of the company under present circumstances. Last year an interim ordinary dividend of 6 per cent. was paid.

The Power Investment Corporation reports a net profit for the year ended March 31st of £40,791, as compared with £40,223 in 1937-38. The ordinary dividend for the year is 3½ per cent. (against 4 per cent.), and £34,722 is carried forward (against £33,824 brought in).

The Northwood Electric Light & Power Co. reports a balance on revenue account for 1938 of £27,702, as against £30,223 in the previous year, plus £2,500 from tax account. The dividend for the year on the ordinary shares is 7 per cent., and £1,419 is carried forward. The dividend for 1937 was 15 per cent. but was paid on smaller capital, a capitalised bonus of 50 per cent. being paid in July, 1938, out of reserve.

The Colne Valley Electric Supply Co. reports a net revenue for 1938 of £24,013, against £29,840 for 1937. The dividend for the year is 4½ per cent. net (against 10 per cent.), and £1,608 is carried forward.

Marconi's Wireless Telegraph Co., Ltd., reports a profit for the year ended December 31st of £268,435, as compared with £260,300 in the preceding year, which with £8,771 brought in and £68,104 transferred from equalisation of dividends reserve, makes £345,310. As we have already announced the final ordinary dividend is 8½ per cent., plus a special dividend of 3 per cent., making a total distribution of 15 per cent. for the year (against 9 per cent.). The 7 per cent. preference shares receive a further participation of 2 per cent. tax free, and the balance carried forward is £12,290.

Tube Investments, Ltd., has declared an interim dividend on the ordinary stock of 10 per cent., and at the same rate relatively on the liaison ordinary shares (unchanged).

The Canadian Marconi Co. reports a net profit for 1938 of $335,915, as compared with $268,377 in the preceding year. After setting aside $50,000 for taxes and adding $479,293 brought in, the balance available is $765,208. Of this $125,000 is appropriated to set up a general reserve and the balance of $640,208 is carried forward. The directors have given consideration to the prospect of recommending a maiden dividend, but have concluded that, in view of the continued expansion of the company's activities, requiring increasing capital expenditure, it would be prudent to conserve resources.

The Eastern Telegraph Co., Ltd., reports a net profit for 1938 of £544,927, as compared with £617,600 in the preceding year. The final ordinary dividend is 5½ per cent. (against 6¾ per cent.), making 9½ per cent. for the year (against 11 per cent.) and £11,635 is carried forward (against £11,708 brought in).

The Telephone Manufacturing Co., Ltd., has announced a final dividend of 6½ per cent., less tax, making 9 per cent. for the year (same).

Glenfield & Kennedy, Ltd., report a profit for the year ended March 31st, subject to audit, of £104,648, as compared with £78,259 for 1937-38. The final dividend is 5 per cent., again making 10 per cent. for the year, and the bonus is raised from 5 to 10 per cent.

The Calcutta Tramways Co., Ltd., reports that after placing £2,500 to second debenture stock redemption account, the net profit for 1938 is £69,837, as compared with £75,023 in the previous year. The ordinary dividend for the year is maintained at 8 per cent. by the final payment of 5 per cent., and £22,031 is carried forward (against £20,694 brought in).

The Atlas Electric & General Trust, Ltd., has announced a final dividend of 3½ per cent., less tax, on the 7 per cent. cumulative preference shares.

Ransomes & Rapier, Ltd., have declared a final dividend of 5 per cent., tax free, on the ordinary shares, making 7½ per cent., tax free, for 1938 (same). The net profits for the year were £26,282 (against £27,137).

The Sphere Investment Trust is paying an ordinary dividend of 5 per cent. for the year ended March 31st (unchanged).

Stocks and Shares

TUESDAY EVENING.

IN spite of the fact that a more cheerful disposition was manifested in Stock Exchange markets on Tuesday afternoon this week, it cannot be said that business shows any material change for the better. The Budget and Herr Hitler's reply to President Roosevelt are both out of the way. The effect of the former was to harden prices, in consequence of the decision to leave income-tax unchanged at 5s. 6d. in the £. The reply of the German Dictator, while at first regarded as being unexpectedly moderate in tone, did little to clarify the outlook, with the result that markets lost the improvement that occurred last Friday.

On rumours of a possible agreement between France and Italy, a general rally occurred, as just mentioned, on Tuesday afternoon, prices advancing in most departments.

Business, however, is still meagre. Changes in our price list, it will be noticed, are comparatively few, and of no great amount in either direction. If there is one feature more prominent than another in this week's fluctuations, it is the dullness that prevails in the prices of gilt-edged and fixed-interest securities. Speaking generally, the attitude is still one of suspended animation. Members of the Stock Exchange, talking amongst themselves, admit quite candidly that the difficulty of seeing one's way just now has scarcely been removed by the events of the past few days.

London Passenger Transport

This week should see the finish of the public hearing by the Railway Rates Tribunal of the London fares claim. The cost of the case is estimated at £50,000 or more. Ten counsel were briefed to represent the five applicants and the 100 objectors. The finding of the Tribunal should be announced some time this month. London Passenger Transport "C" stock remains at 64½, which, on the 4 per cent. dividend last paid, gives a return of £6 4s. per cent. on the money. Some people hope that the result of the inquiry may enable the Board to rearrange its income in a manner which will allow of the dividend being raised from the current 4 per cent.

Thomas Tilling shares have recovered to 42s. No changes have taken place in the British Electric Traction issues.

Capital to the U.S.

The Government have given a broad hint to the effect that the purchase of American stocks and shares by our own people should not be encouraged in such cases as those where the purchases are in the nature of shelters for money. Export of capital at the present time is considered, and rightly, as being hardly in the national interest. Apparently the Government has no desire to stop negotiation of such American stocks and shares as are bought and sold in what may be called the ordinary course of business. But the official intentions have been hinted rather than stated, and there is still a certain degree of hesitation as to how far the arbitrage dealing in American securities can be carried without its being called into question.

As it happens, the American market at the present time is offering few inducements to British capital. Business conditions in the United States have recently been very disappointing to American investors themselves. Nor does the prospect give any sort of indication that early improvement is probable.

American Activities

Optimists across the Atlantic are cautiously forecasting expansion of activity in the industrial circles later in this year. Every now and then, indications appear of a revival in one or other branches of American trade. The railroads, for instance, are doing a good deal better than they were twelve months ago. The European orders for American aeroplanes are assisting various channels of American trade. But, taken all round, there is no such appearance of prosperity as would tempt British capital into the United States, save for the purpose of securing, perhaps, a measure of shelter.

Prices are fairly steady. American Telephone and Telegraph, for instance, have recovered two points to 169½. The daily turnover of shares in the Wall Street Stock Exchange is abnormally small. Similar conditions of uncertainty as those which prevail in this country are evidently present in New York.

Cable and Wireless

The rush on the part of the public to send free cables to various parts of the Empire on Monday in this week seems to have drawn attention to the stocks of the combine. The 5½ per cent. preference and the ordinary stock are both better, though the income stock, at 95½, has followed the downward course common to most gilt-edged securities.

The Eastern Telegraph Company, which is controlled by Cable and Wireless, has declared a final dividend which makes, altogether, 9½ per cent. for the year, against 11 per cent. in the previous twelve months. The company has transferred 968,895 shares in Cable and Wireless to the Government under the beam wireless station agreement. It may be of interest to mention that Eastern Telegraph 3½ per cent. preference stock can still be dealt in. The basis is 72½, and the company's 4 per cent. debenture stands at 94½. Eastern Extension 4 per cent. debenture is quoted at 97. It carries a trifle more accrued interest in the price than the Eastern fours do. Globe ordinary shares have risen 1/16, but the preference, at 23s. 3d., are 6d. lower.

Ever-Ready

The market proved right in having discounted to some extent a cut in the Ever-Ready dividend. For some time the generosity of the yield, on the old dividend rate, has been conspicuous in the group of electrical shares. For 1938 the payment is 30 per cent., against 35 per cent. for 1937, and 45 per cent.—including 10 per cent. bonus—in the year before. The announcement breaks a long line of 35 per cent. dividends paid on a steadily expanding capital. In effect, the amount of ordinary capital has been nearly trebled over the past decade without disturbance, until now, of the rate of dividend. Responsibility for the fall in profits from £531,575 to £456,958 seems to rest with the necessity for paring prices in the face of keen competition, and to the difficulties of trade overseas. Although not unexpected, the results left the price of the 5s. shares 1s. lower at 20s. At the new rate of dividend the yield works out at 7½ per cent. on the money.

Ever-Ready Trust

The Ever-Ready Trust Company, which holds 100,000 ordinary shares in the Ever-Ready Company, held its meeting on Monday in this week, when the dividend of 8 per cent. was confirmed for the ordinary and deferred shares in each case. This is the same rate as that of a year ago. The chairman observed that "the troubled condition of the world to-day makes the lot of any administration hard. It is impossible to foresee what the future has in store"; sentiments which, in one way or another, are repeated at a good many of the public meetings of shareholders now being held. The reduction in the Ever-Ready dividend does not affect the income of the Ever-Ready Trust in the year under review. Next year's income will be reduced, however, on this account to the extent of some £1,200.

Reports and Dividends

The Johnson & Phillips results for 1938 can be added to the already imposing list of electrical companies which, with a fine disregard for general conditions, have done better in 1938 than in the days of the all-round prosperity which marked 1937. Although the change in profits is small, the net figure being £7,500 up, at £133,500, it nevertheless enables the 12½ per cent. dividend to be maintained with an increased margin, which now amounts to the equivalent of another 6 per cent. on the dividend. The company's close connection with the expansion of the electricity supply industry has helped to give the shares a high rating among industrial investments. With the shares unchanged at 57s. 6d., the yield is £6 13s. 6d. per cent.

Electrical Switchgear fell 2s. to 23s. 9d. on the passing of the interim dividend. The Telephone Manufacturing Company is again paying 9 per cent. on the ordinary shares. The price of the shares is 3d. down, at 8s. 9d., but the yield of less than 5¼ per cent. still reflects the high standing of telephone shares in the investor's esteem.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price May 2	Rise or Fall	Yield £ s. d. p.c.
Home Electricity Companies							
Bournemouth and Poole	68/3	63/9	15	15	63/9	−⅛	4 14 4
British Power & Light	30/9	26/–	7	7	28/–	−6d.	5 0 0
City of London	33/9	31/–	7½	7½	32/–	—	4 2 6
Clyde Valley	37/9	34/–	8	8	34/6	—	4 11 6
County of London	46/9	41/9	10½	10½	42/–	—	5 0 0
Edmundson's:							
7% Pref.	31/6	30/–	7	7	30/6	—	4 11 10
Ord.	27/9	23/–	9	9	24/–	—	—
Elec. Dis. Yorkshire	41/6	37/9	9	9	39/6	—	4 11 2
Elec. Fin. and Securities	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	51/9	48/–	12	12	47/6	−6d.	5 1 0
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	34/6	29/–	7½	7½	31/3	—	4 16 0
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric	29/3	26/3	7	7	26/3	—	5 6 8
London Electric	34/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red.	106½	102½	5	5	102½	—	4 17 6
Metropolitan	51/–	45/3	12	12	46/3	—	5 4 0
Midland Counties	38/9	34/–	8	8	37/–	—	4 6 6
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric:							
Ordinary	32/3	28/6	7	7	28/6	—	4 18 3
7% Pref.	32/6	30/–	7	7	31/–	—	4 10 4
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	13	6	6	13	–	4 12 4
North Met. Elec.:							
Ordinary	46/6	41/6	10	10	42/6	−⅛	4 14 1
6% Pref.	29/–	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	27/6	–	5 1 10
Scottish Power	38/9	33/9	8	8	33/9	—	4 14 8
Southern Areas	22/9	19/6	4½	5	20/–	—	5 0 0
South London	30/9	28/–	7	7	28/–	−1⅛	5 0 0
West Devon	23/3	22/6	5	5	1/–	—	4 9 0
West Glos.	21/3	18/–	2	2	18/–	—	2 4 5
Yorkshire Elec.	38/6	34/9	8	8	35/6	—	4 10 2
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/9	—	—
Calcutta Elec.	39/–	36/–	12*	10*	36/–	—	5 11 1
Cawnpore Elec.	34/6	28/9	10	10	28/9	—	6 19 0
East African Power	26/3	22/6	7	7	25/–	—	5 14 0
Jerusalem Elec.	24/6	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	29/6	8*	8	30/–	—	5 6 8
Montreal Power	34½	31	1½	1½	33	−1	—
Palestine Elec. "A"	29/6	26/3	7½*	7½*	26/3	—	5 14 3
Perak Hydro-electric	18/9	15/–	7	6	15/–	−3d.	8 0 0
Shawinigan Power	23½	20	85cts.	83cts.	20⅝	+½	—
Tokyo Elec. 6%	61	50	6	6	50½	−2	11 17 8
Victoria Falls Power	72/–	60/–	12	13½	62/6	+⅛	¼ 6 5
Whitehall Investments Pref.	10/6	16/–	7½	7½	16/6	—	9 1 10
Public Boards							
Central Electricity:							
1950–70	112	106	5	5	106	−2½	4 14 4
1955–75	115½	108	5	5	108½	−1	4 12 2
1951–73	106½	103½	4½	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	86xd.	−2	4 1 5
London Elec. Trans. Gtd.	88½	84	2½	2½	84	—	2 19 6
London & Home Counties, 1955–75	107½	106½	4½	4½	107	—	4 4 1
Lond. Passenger Transport:							
A	114½	104½	4½	4½	105	−2	4 5 9
B	117½	105	5	5	105½	−1½	4 14 9
C	78¼	64½	4¼	4	64½	—	6 4 0
West Midlands Joint Elec., 1948–68	112½	109	5	5	109½	—	4 11 3
Telegraph and Telephone							
American Tel. & Tel.	180	159	9	9	169½	+2	5 6 1
Anglo-Am. Tel.:							
Pref.	101½	89½	6	6	89½	−1	6 14 1
Def.	23⅝	19	1½	1½	19	—	7 18 0
Anglo-Portuguese	24/–	19/9	8	8	21/3	—	7 10 7
Cable & Wireless:							
5½% Pref.	90½	75	4½	5½	82½	+1	6 13 4
Ord.	49	34	4	4	42½	+1	9 8 4
Income	100	95½	—	—	95½	−1	4 3 9
Canadian Marconi $1	5/3	3/9	—	Nil	4/–	—	—
Globe Tel. & Tel.:							
Ord.	28/–	23/6	5½*	7½*	26/3	+⅛	5 14 3
Pref.	26/9	23/3	6	6	23/3	−6d.	5 3 3
Great Northern Tel. (£10)	38	27½	20	20	29½	+1	6 15 8
Inter. Tel. & Tel.	10½	7½	Nil	Nil	7½	—	—
Marconi-Marine	29/–	23/–	7½	10	26/3	—	7 12 6
Oriental Telephone Ord.	2½	46/3	12*	12*	2⅛	—	4 16 0
Radio Corpn.	8¾	6	8	6	6½	—	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	8/6	5	6	9/–	—	3 6 8
Western Union	25½	19½	2½	—	19½	—	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref.	7/6	3/6	Nil	Nil	7/6	—	—
4% Inc.	16	7	Nil	Nil	12	—	—
British Electric Traction:							
Def. Ord.	1000	700	5	6	800	—	—
Pref. Ord.	164	158	8	8	158	—	5 1 3
Bristol Trams	48/6	37/3	8	10	43/9	—	4 11 2
Brazil Traction	13	7⅞	$1	—	11	+⅜	—
Calcutta Trams	25/6	23/6	8	8	23/6	−6d.	6 16 2
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	32/6	−½	6 3 1
Mexican Light:							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	65	—	7 14 0
Southern Rly:							
5% Prefd.	71	48	5	5	60½	−1½	8 5 4
5% Pref.	97½	80	5	5	85	−1	5 17 8
T. Tilling	48/–	39/6	10	10	42/–	+⅛	4 15 3
Tilling & B.A.	53/–	50/–	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	31/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord.	32/3	28/9	15	15	30/–	—	10 0 0
Assoc. Elec.:							
Ord.	45/3	34/9	10	10	37/6	—	5 6 8
Pref.	36/6	34/–	8	8	31/6	—	5 1 7
Automatic Telephone & El.	46/6	39/3	10	12½	42/6	—	5 17 9
Babcock & Wilcox	42/9	37/–	10	12½	41/3	—	6 1 3
British Aluminium Ord.	57/–	48/9	12½	12½	54/3	—	4 12 3
British Insulated Ord.	88/–	77/–	20	20	4⅛	+⅛	4 18 4
British Thermostat (5/–)	16/–	12/–	18½	18½	13/3	—	6 19 7
British Vacuum Cleaner (5/–)	22/6	18/6	40	40	18/9	−⅛	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	—	—
Callender's	92/–	70/–	20	20	80/–	—	5 0 0
Chloride Elec. Storage	82/3	73/–	15	20	3½	—	5 6 8
Consolidated Signal	96/–	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7 15 7
Crompton Parkinson:							
Ord. (5/–)	21/–	14/9	12½	15	17/6	—	—
E. K. Cole (5/–)	9/–	4/–	5	10	5/3	+3d.	9 10 6
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	10/6	+6d.	4 15 3
Electric Construction	38/6	30/6	10	12½	35/–	—	7 2 10
Enfield Cable Ord.	58/6	2½	25	16½	50/–	—	6 10 0
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	−2/–	6 14 9
English Electric	36/–	30/3	10	10	32/6	+6d.	6 3 0
Ensign Lamps (5/–)	14/6	13/9	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	38/9	—	3 4 5
Ever Ready (5/–)	24/–	19/3	45	35	20/–	−1/–	7 10 0
Falk Stadelmann	27/–	25/–	10	10	25/–	—	8 0 0
Ferranti Pref.	25/6	23/6	7	7	24/–	—	5 16 8
G.E.C.:							
Pref.	31/9	29/3	6½	6½	30/–	—	4 6 8
Ord.	82/–	70/9	17½	20	77/6	+6d.	5 3 0
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11 8 2
Hall Telephone (10/–)	22/3	19/3	15	15	18/3	—	8 4 4
Henley's (5/–)	21/–	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/–	21/6	4½	4½	22/6	—	4 0 0
Hopkinsons	43/9	37/3	12½	15	42/–	+9d.	7 2 10
India-Rubber Pref.	21/–	20/–	5½	5½	21/3	—	5 3 6
Intl. Combustion	117/–	97/–	32½	32½	5⅞	−⅛	6 1 4
J. Lucas	60/–	52/–	15	15	57/6	−⅛	5 4 4
Johnson & Phillips	41/–	32/–	10	12½	37/6	—	6 13 6
Lancashire Dynamo	68/–	60/–	25	25	60/–	—	8 6 8
Laurence Scott (5/–)	12/–	10/–	15	15	10/–	−3d.	7 10 0
London Elec. Wire	31/6	29/–	12	7½	30/–	—	5 0 0
Mather & Platt	50/–	42/6	13½	13½	45/–	−9d.	6 0 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	72/6	+⅛	5 10 5
Pye Deferred (5/–	13/9	7/6	5	25	10/–	−6d.	12 10 0
Revo (10/–)	35/6	32/3	12	17½	32/6	−⅛	5 7 8
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	22/6	—	6 13 4
Strand Elec. (5/–)	5/6	4/9	5	10	5/–	—	10 0 0
S. Smith (1/–)	9/9	6/–	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	11/3	−⅛	8 18 0
Telegraph Condenser (10/–)	7/6	5/–	5	5	7/6	—	6 13 4
Telegraph Construction	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–)	10/–	8/–	9	9	8/9	−3d.	5 4 0
Tube Investments	91/–	82/9	23½	23½	85/9	—	5 12 2
Vactric (5/–)	4/3	2/3	10	4	3/9	—	5 6 8
Vickers (10/–)	24/6	19/6	10	10	19/6	−6d.	5 2 7
Westinghouse Brake	54/9	43/9	17½	17½	46/3	−⅛	7 11 4
Walsall Conduits (4/–)	31/9	24/–	55	55	26/3	—	8 7 8
West, Allen (5/–)	7/6	5/9	7½	10	6/6	—	7 13 10

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

18059. "Apparatus for continuously electro-plating strip metal stock." J. S. Nachtman. June 29th, 1937. (503475.)

23880. "Manufacture of dielectric materials." E. I. Du Pont de Nemours & Co., A. A. Levine and O. W. Cass. September 1st, 1937. (503322.)

23892. "Electron-discharge tubes." Telefunken Ges. für Drahtlose Telegraphie. September 1st, 1936. (503221.)

24130. "Methods of and apparatus for laying submarine electric cables." British Western Union, Ltd. February 20th, 1937. (503326.)

26340 "Methods of and apparatus for scanning in television systems." S. L. Clothier and H. C. Hogencamp. October 6th, 1936. (503327.)

26583. "Dynamo-electric machines." W. Scott. October 1st, 1937. (503409.)

26675. "Crossings and turn-outs or junctions of overhead lines used for supplying electric current to trolley-buses, tramcars and like." A. Wiseman & Co., Ltd., A. Wiseman and W. Simmons. October 1st, 1937. (503410.)

26815. "Dry surface contact rectifiers and the like." Westinghouse Brake & Signal Co., Ltd., and A. L. Williams. October 4th, 1937. (503335.)

26842. "Apparatus for electrolytically decomposing liquids." Siemens & Halske Akt. Ges. February 5th, 1937. (503483.)

26848. "Electrolytic condensers." A. H. Hunt, Ltd. (Solar Mfg. Corpn.) October 4th, 1937. (503486.)

26857. "Dynamo-electric machines." T. D. Spencer and Patent Lighting Co., Ltd. October 4th, 1937. (502229.)

26938. "Mechanical scanning devices for televison apparatus." E. Traub. October 5th, 1937. (503493.)

26939. "Television transmitting apparatus." E. Traub. October 5th, 1937. (503494.)

26952. "Electric heating units." British Thomson-Houston Co., Ltd., B. P. Brunt and W. J. Sims. October 5th, 1937. (503495.)

26961. "Electro-magnetic indicators." Standard Telephones & Cables, Ltd., and R. St. G. Terry. October 5th, 1937. (503417.)

26962. "Two-way telephone and like transmission systems." Standard Telephones & Cables, Ltd., R. A. Meers and P. R. Thomas. October 5th, 1937. (503418.)

26968. "Radio and like receivers." Marconi's Wireless Telegraph Co., Ltd., and J. D. Brailsford. October 5th, 1937. (503496.)

26969. "Television receivers." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. October 5th, 1937. (503419.)

26970. "Electrical oscillator apparatus for medical purposes." Marconi's Wireless Telegraph Co., Ltd., and A. W. Lay. October 5th, 1937. (503420.)

26971. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd. November 14th, 1936. (503497.)

26988. "Telephone systems." E. Shipton. October 5th, 1937. (503498.)

26999. "Apparatus for photo-electrically exploring sound records." Zeiss Ikon Akt. Ges. November 23rd, 1936. (503232.)

27031. "Discriminator networks for radio receivers employing automatic fine tuning." E. K. Cole, Ltd., and G. Bradfield. October 6th, 1937. (503501.)

27074. "Cathode-ray tubes." General Electric Co., Ltd., L. C. Jesty and J. Sharpe. October 6th, 1937. (503502.)

27114. "Inductance coils fitted with iron-dust cores." Aladdin Radio Patents, Ltd., and H. C. Hebard. October 6th, 1937. (503236.)

27120. "Snap-action electric switches." C. A. Pooley. October 6th, 1937. (503504.)

27139. "Telephone systems." Automatic Telephone & Electric Co., Ltd., and G. T. Baker. October 6th, 1937. (503343.)

27588. "Electric distant control systems for repeating angular movements." G. M. Pestarini. October 11th, 1937. (Convention date not granted.) (503425.)

27647. "Cathode-ray tube apparatus." E. L. C. White. October 12th, 1937. (503426.)

27748. "Electric furnaces and automatic control arrangements therefor." G. L. Woolnough and Metropolitan-Vickers Electrical Co., Ltd. October 12th, 1937. (503239.)

27838. "Phase-displacing systems for oscillatory directional radio transmitters, receivers, or the like." Aga-Baltic Radio Aktiebolaget. November 26th, 1936. (503428.)

28112. "Control devices and systems for radio sets." Standard Telephones & Cables, Ltd. December 28th, 1936. (503429.)

30387. "Construction of dynamo-electric machines." English Electric Co., Ltd., L. Roberts, R. D. Ball and J. Teal. November 5th, 1937. (503434.)

31622. "Gas and/or vapour filled electric-discharge devices." W. L. W. Schallreuter. November 17th, 1937. (503250.)

31743. "Voltmeters." E. F. Evenden and P. & B. Engineering Co., Ltd. November 18th, 1937. (503437.)

33410. "Electric glow discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). December 2nd, 1937. (503255.)

1938

1198. "Modulating arrangements for high-frequency signalling systems." C. Lorenz Akt. Ges. January 13th, 1937. (503443.)

1880. "Electrical connections." B. Hopps and A. M. Lodge. January 20th, 1938. (503357.)

4439. "Vibration or oscillation dampers for overhead electric conductors." W. B. Buchanan and G. B. Tebo. February 12th, 1938. (503445.)

4565. "Electric rectifiers." General Electric Co., Ltd., and C. R. Dunham. February 14th, 1938. (503446.)

6213. "Electron multipliers." Farnsworth Television, Inc. March 22nd, 1937. (503359.)

10817. "Electric lanterns." A. H. Stevens (Justrite Mfg. Co.). April 8th, 1938. (503368.)

11687. "Electrical indicating instruments." T. Watson and C. J. English. April 19th, 1938. (503282.)

12170. "Electrolytic condensers." Mallory Patents Holding Co., Ltd. September 11th, 1937. (503370.)

15104. "Cathode-ray tubes and circuits relating thereto." Standard Telephones & Cables, Ltd. May 2nd, 1937. (503455.)

16366. "Electrical insulation." E. I. Du Pont de Nemours & Co. June 3rd, 1937. (503376.)

16708. "Arrangements for determining the time of transit of electrical signals in four-pole networks." Siemens & Halske Akt. Ges. June 5th, 1937. (503377.)

20662. "Electrolytic liquid condensers." Standard Telephones & Cables, Ltd. August 19th, 1937. (503460.)

20844. "Printing telegraph apparatus. Creed & Co., Ltd., A. E. Thompson and R. D. Salmon. August 27th, 1937. (Divided out of 490361.) (Cognate application 20845/38.) (503384.)

21246. "Electrical contacts." Igranic Electric Co., Ltd. July 23rd, 1937. (503461.)

21248. "Cap for electric incandescent lamps." Vereinigte Glühlampen und Elektrizitäts Akt. Ges. July 16th, 1937. (503462.)

22330. "Holders for incandescent electric lamps." H. A. Murray and Fitzgibbon and Murray, Ltd. July 27th, 1938. (503386.)

22842. "Alarm signalling systems for repeater stations." Standard Telephones & Cables, Ltd. August 31st, 1937. (503387.)

24480. "Systems of ultra-high-frequency wave transmission." Standard Telephones & Cables, Ltd. September 15th, 1937. (Addition to 420447.) (503467.)

24890. "Methods of and apparatus for scanning in television systems." S. L. Clothier and H. C. Hogencamp. October 6th, 1936. (Divided out of 503327.) (503391.)

25738. "Relaxation generator circuits." C. Lorenz Akt. Ges. September 3rd, 1937. (503468.)

26495. "Radio-receiving apparatus." Radiowerk Horny Akt. Ges. September 13th, 1937. (503469.)

27948. "Hand regulation for electric sadirons." F. B. Dehn (Chicago Flexible Shaft Co.). July 30th, 1937 (Divided out of 503219.) (503298.)

27949. "Electric sadirons." F. B. Dehn (Chicago Flexible Shaft Co.). July 30th, 1937. (Divided out of 503219.) (503299.)

29326. "Navigation-aiding radio receiving systems." Telefunken Ges. für Drahtlose Telegraphie. October 8th, 1937. (503471.)

30661. "Lighting systems." R. R. Hoare. October 2nd, 1937. (Divided out of 26725/37.) (Cognate applications 30662/38 and 30663/38.) (503300.)

31822. "Electric lamps." British Thomson-Houston Co., Ltd. November 5th, 1937. (503398.)

33075. "Electric-discharge devices." British Thomson-Houston Co., Ltd. November 13th, 1937. (503305.)

38005. "Electric kitchen stove or oven." E. Challet. October 8th, 1937. (Divided out of 493379.) (503474.)

1939

943. "Electron multipliers." F. J. G. van den Bosch. July 3rd, 1937. (Divided out of 500189.) (503314).

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 26th.

Crypton (lettering and design). No. 586947. Class 6 (III). Battery charging machines, &c. Crypton Equipment, Ltd., North Acton Road, Park Royal, N.W.10.

Klas jeho pána (Czech words for His Master's Voice). No. 604973. Class 9 (IV). Apparatus, instruments and devices for the recording, reproduction and reception of sound, and television receiving apparatus, and parts thereof. The Gramophone Co., Ltd., Blyth Road, Hayes, Middlesex.

Fluxlume. No. 604736. Class 11 (IV). Lighting fittings. The Co-operative Wholesale Society, Ltd., 1, Balloon Street, Manchester.

Alerto. No. 605178. Class 11 (IV). Electric torches. Douglas H. Bellars Cowman, The Laboratory, Worth Matravers, Dorsetshire.

Pirtoid. No. 603805. Class 17 (IV). Paper and linen varnished with synthetic resins in the form of tubes, sheets and shaped pieces, all being electrical insulating materials. H. Clarke & Co. (Manchester), Ltd., Atlas Works, George Street, Patricroft, Manchester.

Atlas. No. 603806. Class 17 (IV). Electrical insulating materials made wholly or principally of mica and electrical insulating tapes made of cotton. H. Clarke & Co. (Manchester), Ltd., address as above.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberystwyth.—May 17th. Electricity Department. Extra-high-voltage, 6,600-V and low-voltage underground cables and overhead distribution line material. (April 28th.)

Australia. — MELBOURNE. — May 23rd. Three outdoor-type lightning arrestors. (T. 21150/39.)*

May 23rd. Posts and Telegraph Department. Quantities of underground cable. (T. 21680/39.)*

BRISBANE.—May 24th. Dalby Town Council. One electrical water level indicator, including transmitter, indicating receiver, storage batteries and all necessary electrical and mechanical equipment. (T. 20654/39.)*

Birmingham.—May 8th. Electric Supply Department. Single-phase prepayment meters with fixed charge collectors for six months. (April 28th.)

May 17th. Cable jointing compound for twelve months. (See this issue.)

Bridlington.—May 11th. Town Council. High- and low-voltage sub-station equipment. (April 28th.)

Bristol.—May 9th. Electricity Department. Cast-iron economiser for Feeder Road generating station. Chief engineer, Electricity Department, Colston Avenue (deposit £2 2s.).

Burnley.—May 15th. Electricity Department. Cables. (See this issue.)

Bute.—May 8th. County Council. Electrical work at housing estates. Schedules from R. Rennie, architect, 23, Bradshaw Street, Saltcoats.

Clydebank.—Town Council. Electrical work at Mountblow housing estate (224 houses). Town Clerk (deposit £1).

Croydon.—May 18th. Electricity Department. Stores and materials for twelve months. (See this issue.)

Dundee.—May 15th. Housing Committee. Electric lighting installation at Kirkton estate. Town Clerk.

Edinburgh. — May 12th. Electricity Supply. Installation of electric lighting and power in West Pilton school. Town Clerk (deposit £1 1s.).

May 6th. High-voltage switchgear to Spec. No. 170. Town Clerk.

Epsom and Ewell.—May 15th. Electricity Department. Low- and high-voltage cables. (April 21st.)

Glasgow.—May 8th. Electricity Department. Meters and cable covering tiles for twelve months. (April 21st.)

Gloucester. — Electricity Department. Two 10,000-kVA and three 700-kVA transformers. (See this issue.)

Hull.—May 16th. Electricity Department. Sliding surface and screw-cutting general purpose lathe. (See this issue.)

India.—SIMLA.—May 16th. Indian Stores Department. One 120-kVA Diesel alternator generating set. (T. 21348/39.)*

Iraq.—BAGHDAD.—May 15th. Ministry of Interior. 75-kW electric generating set. (T. 21640/39.)*

Kettering.—May 15th. Electricity Department. One 3,000-kVA transformer, metal-clad switchboard, switch units and one control panel. (April 28th.)

Leeds.—May 10th. Transport Committee. One electrically operated engine-testing dynamometer plant, suitable for oil and petrol omnibus engines. (See this issue.)

June 1st. Sewerage Committee. Sewage-pumping equipment, comprising electrically driven centrifugal pumps, motors, control and switchgear, cables, cast-iron pipes, valves and instruments in the main pumping station, Low Level Works, Knostrop. Town Clerk's Office, Room 57, Civic Hall (deposit £2).

Liverpool.—May 8th. Electric Supply Department. Six 250-kVA step-down transformers. (April 28th.)

May 19th. Eight 5,000-kVA step-up transformers, two 25,000-kVA and four 15,000-kVA step-down transformers, two 33,000-V circuit-breaker units, one thirteen-panel 11,000-V switchboard and sundry 11,000-V oil-immersed isolating switches. (See this issue.)

May 26th. Electric Supply Department. High- and low-voltage switchgear for static sub-stations. (See this issue.)

London.—COMMISSIONERS OF H.M. WORKS.—May 19th. Cable at the Royal Ordnance Factory, Bishopton. (April 28th.)

STEPNEY. — May 23rd. Electricity Supply Undertaking. Meters, demand indicators, conduits, troughs and covers and 15-W to 1,000-W lamps. (April 21st.)

Manchester.—May 8th. Electricity Committee. Five 600- V DC switchboards and the transfer and re-erection of three similar switchboards. (April 28th.)

May 15th. Electricity Department. Steel casings for grit arrestors at Barton power station, mercury arc rectifiers, and steel cubicle type switch cubicles. (See this issue.)

Newcastle-on-Tyne. — Education Committee. Electric lighting installation at the Raby Street Council School. Plans by the education architect, Northumberland Road.

New Zealand. — WELLINGTON. — May 24th. Posts and Telegraph Department. 60,000 porcelain insulators. (T. 20755/39.)*

May 23rd. 7,920 ft. of telephone cable. (T. 20753/39.)*

AUCKLAND.—May 29th. Electric Power Board. 2,000 yd. of 4-core, 0.04 sq. in. cable, 4,000 yd. of 4-core, low-voltage cable, and 5,000 yd. of 4-core special low-voltage cable. (T. 21821/39.)*

WELLINGTON.—June 7th. Public Works Department. Six 11,000/460/230-V single-phase transformers. (T. 21908/1939.)* 260 highway lighting units. (T. 21907/1939.)*

Nottinghamshire.—May 22nd. County Council. One electric truck at Ransom Sanatorium. (See this issue.)

Portsmouth.—May 15th. Electricity Undertaking. 11-kV overhead line at Compton and West Marden, Sussex. (See this issue.)

Plymouth — May 20th. Electricity Supply Department. Two rotary boiler feed pumps and accessories. (April 21st.)

Rochester.—May 12th. Rochester and Chatham Joint Hospital Board. Electrical installation at St. William's Hospital for Infectious Diseases, St. William's Way. (April 21st.)

Roxburgh.—May 17th. County Council. Electrical work at Denholm and St. Boswells housing estates. County Clerk, Newtown St. Boswells.

South Africa. — JOHANNESBURG.—May 17th. City Council. 50-, 75-, 100-, 150-, 200-, 250-, 300- and 400-kVA transformers for twelve months. (T. 21178/39.)*

May 17th. Quantities of 30-A and 100-A cutouts for pole mounting. (T. 21746/39.)*

May 20th. 1,300 300-A, 6,600-V isolating links for use in pillar boxes. (T. 21877/39.)*

May 18th. Public Works Department. One self-cooled transformer and one low-voltage and one high-voltage switch. (T.Y. 21315/39.)*

PRETORIA.—May 11th. Union Tender and Supplies Board. Thirteen battery charging sets. (T. 21395/39.)*

May 18th. Switchgear, transformers and cables for the Waterkloof Air Station (T. 21316/39.)*

May 25th. Five 60-gal. and two 30-gal. automatic electric water heaters. (T. 21751/39.)*

June 8th. Four loading coil pots, stubless type, each containing eighty-three 120 millihenry coils. (T. 21747/39.)*

Southern Rhodesia. — BULAWAYO.—May 22nd. Electricity Department. Switchgear, cable and a transformer. (T.Y. 21180/39.)*

Southend-on-Sea.—May 18th. Electricity Department. High- and low-voltage underground cables for two years. (April 21st.)

Stoke-on-Trent.—May 10th. Electrical Engineer's Department. Twelve months' supply of high-pressure mercury vapour lamps for street lighting, complete with lanterns and columns. (April 21st.)

Sunderland.—May 17th. Public Assistance Committee. One insulated chamber, complete with all necessary electrically driven refrigerating machinery, at Highfield Institution, Hylton Road. (See this issue.)

Uruguay. — MONTEVIDEO. — June 5th. State Electricity Supply and Telephones Administration. Fifty-two oil-cooled, three-phase, outdoor-type potential transformers, with spares. (T.21720/1939.)*

May 22nd. Metering, control and regulation apparatus for generating sets at various power stations. (T.Y. 21721/39.)*

Wallasey.—May 16th. Borough Council. House service meters for two years. (April 28th.)

Walton and Weybridge.—May 16th. Electricity Department. Low-voltage, p.i., lead-covered and steel tape armoured cables and domestic wash-boilers for twelve months. (April 28th.)

May 16th. Two 300-kVA transformers and two 11-kV pedestal-type switches. (See this issue.)

Warrington.—May 15th. Electricity Department. One electric tower wagon. (April 28th.)

Wolverhampton.—May 10th. West Midlands J.E.A. Two banks of 33,000-V, three-phase, bus-bar reactors and two banks of 6,600-V works-feeder reactors for the Authority's generating station. (April 28th.)

Worcestershire.—June 2nd. County Council. Lighting and power installations at nurses' home to be erected at Kidderminster. E. S. Hoare, consulting engineer, Lancaster House, 67, Newhall Street, Birmingham.

Orders Placed

Barking.—Electricity Committee. Accepted. Cables (£2,423).—Henley's.

Eccles.—Electricity Committee. Accepted. Feeder panel (£493).—B.T.H.

Glasgow.—Transport Committee. Accepted. DC feeder panels and traction equipment.—Electric Construction Co.

Liverpool.—Electric Power and Lighting Committee. Accepted for twelve months: 60-A all-insulated switches.—G.E.C.; Foster Engineering Co. Wash-boiler and cooker units.—G. P. Dennis.

London. — HAMMERSMITH. — Electricity Committee. Recommended. 10,000 fuses and 20,000 insulated nuts.—B.I. Cables.

METROPOLITAN WATER BOARD.—Accepted. Two electrically operated needle valves for Hampton works (£1,050).—Guest & Chrimes.

ST. MARYLEBONE.—Health Committee. Accepted. X-ray equipment (£1,357).—Watson & Sons.

Electricity Committee. Recommended. Two electric vehicles (£796).—Associated Electric Vehicle Manufacturers, Ltd.

Middlesbrough.—Town Council. Accepted. Installation of two 10-cwt. electric bed lifts at the Holgate Hospital.—Pickerings, Ltd.

Newcastle-on-Tyne.—City Council. Accepted. Switchboard panel for the Manors main sub-station (£446).—A. Reyrolle & Co. Electrical materials required in connection with housing repairs for twelve months.—R. H. Patterson & Co.

Swansea. — Corporation. Accepted. 37,500-kW Brush-Ljungstrom turbo-generator for Tir John power station (£152,000).—Brush Electrical Engineering Co.

Wallasey.—Water Committee. Accepted. Plant and machinery for DC supply to waterworks (£2,487).—G.E.C.

Electricity Committee. Accepted. Supply and laying cable from Seaview Road and New Brighton sub-stations (£2,531).—Crompton Parkinson. Seven 50-kVA transformers (£378).—Yorkshire Electric Transformer Co. Eleven 100-kVA, three 250-kVA, and one 250-kVA transformers (£1,529).—Ferranti. Street-lighting poles (£169).—B.T.H. Seventeen switch pillars (£791).—B.I. Cables.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick. — Houses (72), Radcliffe; R.D.C. architect.

Amble.—Houses (50), Ivy Street estate; U.D.C. surveyor.

School (£28,000); J. G. Green and Son, contractors, The Butts, Warkworth, Northumberland.

Barking.—Houses (55) and seven shops, Axe Street; Truett & Steel, Ltd. Factory, Thames Road; C. & M. Welding Co., Ltd.

Barnsley.—Houses (64), Ledbury Road, &c.; H. Hibbert.

Barnstaple. — Senior girls' school (£26,000), for E.C.; H. H. Hawkins, education secretary.

Bath.—Nurses' home for the Bath Royal United Hospital (£50,000).

Beeston.—Cinema, The Square, for A. H. Shapeero; W. Newman, architect, 24, Johnson Road, Lenton, Nottingham.

Bexhill-on-Sea.—School, Bexhill Down (£55,000), for the E.C.; Beresford, Marshall & Partners, architects, 12, Grand Avenue, Hove.

Bilston.—Baths (£46,576); borough engineer.

Birmingham.—Factory, Carver Street, for E. Strang & Co.; S. F. Swift & Son, contractors, 200, Alcester Street, Birmingham. Bus depot, Ridgacre Road: city engineer. Houses, Mill Pool Hill Estate; Burbery Estates Co., Ltd. Additions to the R.C. Church, Warwick Road, Acocks Green (£7,000), with electrical work. Clinic, Warstock Lane (£3,600); city engineer. Houses (10,000), Coleshill, between York Wood and Windy Arbour, for the Housing Committee; H. T. Manzoni, city engineer. Houses (24), Court Lane, Erdington; G. Holt, contractors, 45, Goosemoor Lane, Erdington, Birmingham. Colleges for technical, commercial and art education, Gosta Green, for E.C.; H. V. Ashley and Winton Newman, architects, 14, Gray's Inn Square, London, W.C.1.

Bishop Auckland.—Houses (44), E. Pye & Son, builders, Etherley Gardens, Bishop Auckland.

Blackpool.—Houses (22) and four garages, Walbreck Hill Road and Countess Crescent; G. Hodgson & Sons (Builders), Ltd., 10, Finchley Road, North Shore. R.C. School, Glastonbury Avenue, Marton; R. Mercer, architect, 11, Chapel Street, Preston.

Brackley.—Houses (54); R.D.C. surveyor.

Brandon (Co. DURHAM).—Houses (98), Ushaw Moor; F. Hedley, U.D.C. architect.

Bristol. — Houses (106), Southmead estate, for T.C.; city architect, Eagle House, Colston Avenue.

Broompark (Co. DURHAM).—R.C. school (£17,000); R. Burke, architect, Singleton House, Northumberland Road, Newcastle-on-Tyne.

Bungay. — Houses (70) Annis Hill estate; U.D.C. surveyor.

Cardiff.—Development of part of Queen Anne Square; Walker Building Co. (Cardiff), Ltd., 3, Castle Street.

Chipping Norton.—Houses (39), in rural area, for R.D.C. surveyor.

Cleckheaton.—Extensions to factory and offices, Savile Street, Hunsworth Lane; British Belting & Asbestos, Ltd.

Coventry.—Factory and offices, Templar Avenue, for Motor Packing Co., Ltd.; G. A. Steane, architect, 5, Queen Victoria Road. Houses (257); city engineer.

Croydon.—Houses (32), The Glade, Ham Farm estate, for T.C.; borough engineer, Town Hall.

Cumberland.—School, Silloth; county architect, 4, Alfred Street North, Carlisle.

Darlington.—Premises, Priestgate, for the Darlington Co-operative and Industrial Society. Extensions to Albert Hill works for the Darlington Rustless Steel & Iron Co., Ltd.

Derby. — Extensions to aerodrome (£21,688); borough engineer.

Diss.—Premises, Mere Street for F. W. Woolworth & Co., Ltd.

Doncaster.—Odeon Cinema (£60,000), Hall Gate and Wood Street, for the Odeon Cinemas, Ltd.; F. Miskin & Sons, Ltd., contractors, Romeland, St. Albans, Hertfordshire.

Durham.—School, Framwellgate Moor, for the C.C.; county architect, 34, Old Elvet, Durham. Alterations to Durham Institution, for the County P.A.C.; Dixon Elliott & Sons, builders, Durham.

Easington.—Houses (18), South Hetton; R.D.C. surveyor.

Eastbourne.—Houses (60), Highfield estate; B. & T. A. Groves. School, Brodrick Road, Hampden Park, for the E.C.; Borough Engineer's Office, Town Hall, Eastbourne.

East Kesteven. — Houses (20), Fen Road, Ruskington, for R.D.C.; Council's architect, Council Offices, Northgate, Sleaford.

Esher.—Houses (124); U.D.C. surveyor.

Essex.—Enlargement of Canvey Island senior school (£11,963); erection of Hornchurch Elm Park school (£10,671), and erection of Hornchurch Ravenscourt Grove school (£10,866), for E.C.; J. Stuart, county architect, Chelmsford.

Gainsborough.—Cinema, Church Street, for R. L. Kemp, Whitefriars House, Friars Lane, Nottingham; J. H. Metcalf Bros., contractors, 62, Cunningham Road, Doncaster.

Gateshead-on-Tyne. — School; F. H. Patterson, borough engineer.

Glasgow. — Baths, Glasgow Green (£83,000); A. M. McDoughall & Co., Ltd., and Clyde Structural Iron Co., Ltd. Office buildings, Cogan Street, for Donaldson & Filer, Ltd., Effendi works; James T. Thomson and Partner, architects, 212, Bath Street.

Gloucester.—Grammar school, Podsmead (£54,942), for the E.C.; W. A. James & Sons, builders, Maidenhead.

Gloucestershire. — Institution, Stroud (£45,000), for P.A.C.; county architect, Gloucester.

Great Barr (BIRMINGHAM). — Community centre (£25,000); First National Housing Trust, Ltd., Pheasey Farm Estate Office, Great Barr.

Halifax.—Houses (32), Shaw Hill and Sedburgh Road; Halifax Housing & Improvement Trust.

Hebburn-on-Tyne.—R.C. senior school for the E.C.; R. Burke, architect, Singleton House, Northumberland Road, Newcastle-on-Tyne.

Jarrow-on-Tyne.—Extensions to Bede Burn Road school; J. S. Weir, borough engineer.

Keighley.—Two-storey bus garage and offices; S. Needham & Son, architect, 3, Duncombe Place, York.

Kettering. — Extension to hospital, Rothwell Road; A. P. Lewis, Burton Latimer.

Kilmarnock.—Houses (300) for the Corporation; burgh surveyor.

Lancashire. — Hospital, Ulverston (£89,728), for the C.C. R.C. senior school, Newton-le-Willows (£31,000), for the County E.C. School, Skelmersdale, for the County E.C.

Leek.—Mill, Nelson Street, for the Co-operative Wholesale Society, Ltd., Balloon Street, Manchester; Co-operative Wholesale Society, Ltd., contractors, Building Department, Vere Street, Salford, Manchester.

Linlithgow.—Cinema and shops, High Street, for Caledonian Associated Cinemas, Ltd.; A. Cattanach, architect, The Laurels, Kingussie.

Liverpool.—Factory (£30,000); city engineer.

Llanelly. — Houses (54), Cilaugwyn estate; R.D.C. surveyor.

London.—(BERMONDSEY).—Flats, Enid Street; borough engineer. (WESTMINSTER, S.W.1)—Rebuilding St. John's Clinic and Institute of Medicine, Ranelagh Road; A. Bryett, architect, 30, Ebury Street, S.W.1.

Manchester.—Works, Lyons Road, and Tenax Road, Trafford Park, Manchester, for Gaigy Colour Co., Ltd., 8, St. Mary's Parsonage; R. Carlyle & Co., Ltd., Elsinore Road, Old Trafford, Manchester.

Middlesbrough.—Houses (12), Farndale Crescent, for H. Halliman; F. Jackson, architect, Queens Square. Houses (18), Merlin Road; C. J. Boyd, Ltd., builders, 15, Emmerson Street, Linthorpe. Branch library near Holmwood Avenue (£3,000); borough engineer.

Morecambe.—Extensions to premises, Westgate; Morecambe Electrical Equipment Co., Ltd.

Myerscough.—Aerodrome; Blackburn & Preston Corporations.

Newcastle-on-Tyne.—Houses (45) and flats (88), Edward Street rehousing area for the City Council; W. D. Allison, builder, Whitburn, South Shields.

Newton-le-Willows. — Additional bay (200 ft. by 60 ft.), Vulcan works, for the Vulcan Foundry, Ltd.; engineer, W. Neill & Sons (St. Helen's), Ltd., contractors, Bold Iron Works, St. Helens.

Northampton.—Houses (24), Kingsway; A. Glenn & Sons, Ltd. Houses (22), Lovat Drive; Chowns, Ltd. Houses (22), London Road; R. & H. Fletcher, Ltd. Additions to Northampton General Hospital, Billing Road; governors.

Norwich. — Houses (74), Heigham Street, for T.C.; city architect, City Hall.

Nottingham.—Extensions to Chesterfield & North Derbyshire Royal Hospital (£50,000).

Scunthorpe. — Houses (30), Crosby estate, for T.C.; W. Farrar, borough surveyor.

Sheffield.—X-ray dept., Royal Infirmary, Upperthorpe Road; Board of Management.

Sneyd Green.—Houses (43), Handley Road, and warehouse, Sneyd Street; Leake & Co., Sneyd Street.

Spennymoor (Co. DURHAM).—Houses (380); G. Gray, architect, Camden Street, North Shields.

Sunderland.—Houses (16), Ford, for the R.D.C.; J. & T. Parker, builders, Commercial Road, Sunderland.

Tamworth.—Fire station, Lichfield Street, for Fire Joint Committee; A. Oswald Marshall, borough surveyor.

Teddington.—Extensions (£10,000), Teddington, Hampton Wick and District Hospital, Hampton Road; J. P. Briggs, architect, Effingham House, Arundel Street, London, W.C.2.

Thornaby-on-Tees.—Extensions to Town Hall; houses (60); J. G. Knowles, borough engineer and architect.

Todmorden.—Houses (102), Castle and Carr House estates; borough engineer.

Tottenham.—Factory, Ferry Lane; J. Stewart (Tottenham), Ltd.

Twickenham.—Houses (52), Collingwood Close; Hilbery Chaplin, Ltd. School, Heathfield site (£34,763); H. G. Denne & Son, Ltd.

Tynemouth.—Houses (26), The Broadway; A. and E. Brannen, builders, North Shields. Gymnasium and staff rooms at the Municipal High School for the E.C. (£8,700); W. Wilson & Co., builders, Cambois, Blyth. Extensions to the Tynemouth Jubilee Infirmary (£250,000); Hastie D. Burton, Ltd., contractors, King Street, North Shields, Northumberland.

Urmston.—Houses (129), Winchester Road, Davyhulme; A. Locke, Ltd., builders, Lostock Road, Davyhulme, Manchester.

Wallasey.—Extensions to grammar school (£6,500) for the E.C.

Wallingford.—Houses (50), Didcot, for R.D.C.; surveyor.

Walsall.—Factory, Wednesbury Road; Walsall Lithographic Co., Ltd. Factory extension, Walsingham Street; John Parfield & Co. Warehouse and offices, Mountrath Street; E. Toon, Ltd.

Weardale (Co. DURHAM).—Additions to Town Hall for the R.D.C.; J. R. Ridley, architect, Town Hall, Stanhope.

Wednesbury.—Houses (159), Manor estate; A. Booth, borough surveyor.

Wenlock.—Houses (58), Madeley estate; borough engineer.

Whitley Bay.—Houses (20), Fairfield Green estate; R. Ramsay, builder, Whitley Bay.

Winchester.—New block of offices, Romsey Road, for R.D.C.; Edward G. Breed, building surveyor, 45, Romsey Road, Winchester.

Wiltshire.—School, Ludgershall, for the E.C.; T. Walker, county architect, County Offices, Trowbridge.

Wolverhampton.—Houses (10), Deans Road, for the T.C.; A. N. Bloxham, contractor, 164, Penn Road. Houses (38), Old Heath Road; A. M. Griffiths, Ltd., contractors, Thomas Street.

Worcestershire.—School, Bewdley, for the E.C.; A. V. Rowe, county architect, 38, Foregate Street, Worcester. School, Pershore, for the E.C.; county architect.

Worthing.—Houses (60), Tower Road, Lancing, for R.D.C.; J. W. Calvert, clerk, 15, Mill Road, Worthing.

Yorkshire.—School, Thorntree Road, Thornaby-on-Tees, for the North Riding C.C.; county architect, County Hall, Northallerton.